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THE UNIVERSITY OF ALBERTA

ACTIVITY PATTERNS UNDER STRESS: THE CASE OF HIGH-RISE APARTMENT DEVELOPMENTS IN URBAN NEIGHBORHOODS

by

SI-MING LI (C)

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF ARTS

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THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled ACTIVITY PATTERNS UNDER STRESS: THE CASE OF HIGH-RISE APARTMENT DEVELOPMENTS IN URBAN NEIGHBORHOODS submitted by SI-MING LI in partial fulfilment of the requirements for the degree of MASTER OF ARTS.

.....
Supervisor

.....

.....

Date May 14, 1976

To My Beloved Mother

ABSTRACT

This thesis examines one aspect of *in situ* adjustments to locational stress: the change in the individual's activity routines. The choice of stress is high-rise apartment developments in residential neighborhoods. Both *a priori* reasoning and empirical evidence suggest that, to the neighboring householders, high-rise apartment development is essentially a negative environmental stress, in the sense that their utility level attained will be reduced. This reduction in utility is found to be a result of the individual's dissatisfaction with the changes in the physical and social environments of the neighborhood associated with high-rise developments. It is hypothesized that under such a stress:

(1). the time allocated to activities which are negatively affected will be reduced;

(2). the entire activity pattern of the individual will be shifted.

A cross sectional approach is adopted to test the time related hypotheses. Data on time allocation patterns were obtained by a questionnaire survey conducted in June, 1975. The result shows that the first hypothesis is valid. However, the data do not give supporting evidence to the second. Nevertheless, a closer examination of the data indicates that neighborhood environment is an important factor in determining the individual's activity pattern. The rejection of the second hypothesis only suggests that stresses such as high-rise developments may not be sufficient to have a significant

impact on the entire time allocation pattern of the individual.

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CHAPTER ONE

A DISCUSSION ON THE HUMAN ACTIVITY SYSTEM

I. Introduction

To understand the very intricate processes and forms of human organization over geographic space, the human geographers have undertaken three lines of inquiry. First, there are studies concentrating on the mental cognitive state governing spatial decisions. Second, there are studies of the overt spatial behavior of individuals and groups to examine the actual linkages of human activities over space. Third, efforts can be found trying to search for laws and order of the underlying geometric properties characterizing the aggregate spatial form of society. Each of these approaches is a legitimate premise for the advancement of our research frontier and can be viewed as a method to render the geographic complexity into an analytically tractable system. They are not ways to study isolated, independent facets of the geographic reality.[1] The interdependent nature of these approaches to geographic inquiry can be illustrated schematically (Figure 1-1).

It is shown in the diagram that phenomena of geographic relevance can be classified into three major categories or levels, signifying the different orientations to geographic research. However, phenomena in any particular category cannot be understood in isolation. Knowledge

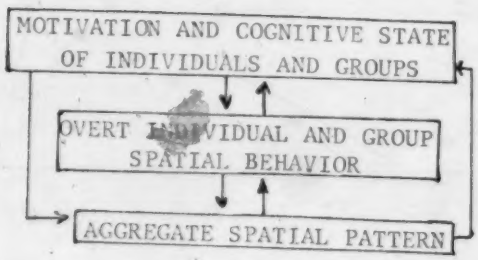

MOTIVATION AND COGNITIVE STATE OF INDIVIDUALS AND GROUPS
OVERT INDIVIDUAL AND GROUP SPATIAL BEHAVIOR
AGGREGATE SPATIAL PATTERN

Figure 1-1 The Relation Among the Three Approaches to Geographic inquiry

of phenomena occurring at other levels have to be brought into consideration or assumptions have to be made.[2] For instance, in formulating the hexagonal networks of central places, it has to be postulated that every consumer has an image of an isotropic plane; that people would travel to the nearest market center; and that the behavior of buying more than one good in a single trip is non-existent.[3] Moreover, the significance of a study depends not only on how accurately it can describe the phenomena that the study focuses on, but also on how much explanatory power it can provide, as a feedback, for the understanding of phenomena occurring at other levels. Referring to the example of Central Place Theory, the derived system of hierarchical market centers forms the basis of many studies on consumer's spatial behavior, especially on the distribution and frequency of shopping trips in both intra-urban and inter-urban contexts.[4] Similarly, a study concentrated on the overt behavior of individuals or groups may lead to refinements of the assumptions used in the normative theories of spatial forms.[5] Therefore, the linkages between

any two levels of phenomena, as shown in Figure 1-1, are reciprocal. The choice of explanatory variables and feedbacks would largely define the starting point of any geographical research.

In the present study, the focus will be given to the overt behavior of individuals and households, especially their daily activity routines, as related to changes in their neighborhood residential environment brought about by the construction of high-rise apartments. That is, the changes in the urban spatial pattern is treated as a variable to explain behavior on the individual level.[6] In order to have a more complete understanding of the relationship involved, an attempt will be made to examine the individual's cognitive state under the environmental changes concerned. Hopefully, as feedbacks to the study, some insights can be gained towards better understanding of the developmental processes of the urban spatial structure.

Since the study will concentrate on the individual's and household's daily activity routines, which form integral parts of the human activity system, a review of the theoretical and empirical issues concerning the human activity system will be given in the next section.

II. The Human Activity System

A. Properties of An Activity System

"An activity can be looked at as a transformation process

involving an initial state of events which is subject to an operation resulting in a new state of events."[7] This process of transformation may be an act of movement, for example, the relocation of a household from one part of a city to another; or a process of production, for example, the conversion of iron into steel. This process is an outcome or an episode of a series of decision makings by a person, a household, a firm or any other human organization.[8] To every behavioral system, of which the human being is an example, there exists a set of goals or motivations, and needs which is either genetically inherited or experientially gained.[9] As far as the human being is concerned, this set includes the biological instincts to survive and reproduce, the felt needs of security and territoriality, the fulfillment of certain role expectations and mere satisfaction acquired by performing certain activities. These motivations and needs largely determine the behavioral system's propensity to engage in an activity and is labelled 'the predisposing action' of the system.[10] Since there is a multitude of goals and needs, there is a multitude of activities that the individual or any other behavioral system will pursue. They range from those that are fundamental to the survival of the individual, such as eating, sleeping and working, to those 'supplementary' activities that are conducive to the full well-being of the individual, for example, cultural and recreational activities.[11]

Each activity performed by the individual is not an isolated phenomenon, but is linked to other activities in a certain order. The pattern of linkages is termed 'the transformation network' by Herbst[12] and 'the activity system' by Chapin and Brail.[13] It contains two components:

(1). A time rymthm component. Each activity within the activity system has to occupy a certain amount of time and be in sequence with other activities. Moreover, most activities are performed in a rather regular and recurrent manner, such as daily, weekly, yearly or in any other time scales.[14] For instance, the journey to and from the work place is carried out in a daily base while recreational activities tend to have a weekly or seasonal rymthm.

(2). A spatial dimension. Each activity has to take place in a geographical space. Some activities occur within a very limited spatial extent and in a more or less fixed location, for example, working in the office. Others may spread over a rather extensive area, for example, the journey to work, and show a high degree of variability in their location of occurrence, an example of which is sightseeing.[15]

These two components of the activity system are, to a certain degree, dependent on each other. For instance, the time and the associated opportunity costs spent on the journey to work are largely determined by the distance from the home base to the work place. This in turn will affect the availability of time for doing other activities. Thus when time is limited, the spatial extent of

the activity system will be conserved.[16] In addition, the regularities of the activity occurrence in time define, to a certain extent, the spatial regularities of the activity system. The daily spatial extent of the activity system, for example, is defined by the locations of the individual's home base and work place, and by the time he put into working and into home based activities. Horton and Reynolds termed this more or less fixed daily spatial extent of the system as the 'activity space.'[17]

In order to attain the maximum level of satisfaction, the individual or any other behavioral system has to seek an optimum juxtapostion of all his activities in time and space. His ability in doing so defines the 'level of integration' of the activity system.[18] In searching for a place to live, for example, the individual will take into consideration the locations of all activities that he would engage in, such as working, shopping, recreation and others. The journeys to all these locations directly or indirectly from his home base involve both monetary and time costs. The individual will seek a combination and arrangement of activities such that his level of satisfaction is maximized, given the constraint of the income budget. If he is allowed to live freely in any location in the city, he will compare the utility levels obtained at different locations when the combination and arrangement of activities are optimized at every location and choose the one that gives him the

greatest satisfaction.[19] This choice of residential location and the combination of activities give a new perspective on the classical theories of urban spatial structure and is of profound significance to the geographers, although not all activities belong to the category of spatial behavior.

B. An Explanatory Model of the Human Activity System

It has been noted that the human being has a set of needs and desires and that the activities he engages in are the means towards this set of ends. The decision whether he will participate in certain activities is essentially a choice mechanism and can be represented schematically (Figure 1-2). In the figure, it is indicated that the individual's propensity to engage in certain activities is determined by his needs and desires and the expected reward or utilities in doing the activities concerned. The individual will, other things being equal, choose a certain combination of activities out of a perceived set of workable alternatives, shown in the figure as the opportunity set of activities, in order to maximize, or at least, 'satisfice',[20] his expected reward or satisfaction. The experience of actual involvement in the activities chosen will in turn affect the expected utilities associated with the activities concerned.

Kofoed suggests that the actual number of choices in the opportunity set, as shown in Figure 1-2, is rather limited.[21] Hagerstrand argues that the best way to understand the activity system is to

study the constraints that limit the size of the opportunity set. He identifies three essential types of constraints:[22]

(1) Capability Constraints. It represents the biological and technological limits the individual can attain. With respect to the spatial extent of the activity system, it is usually thought to be very limited when the individual is young, gradually enlarging when he matures, and shrinking thereafter. The availability of modern means of transportation such as the automobile will alter the system's spatial extent tremendously. However, it is mainly determined by the economic resources that the individual can employ and would not have the same degree of influence on each of the individuals being affected. This type of constraint is broadly equivalent to the 'ability to use' dimension in Pred's behavioral matrix.'[23]

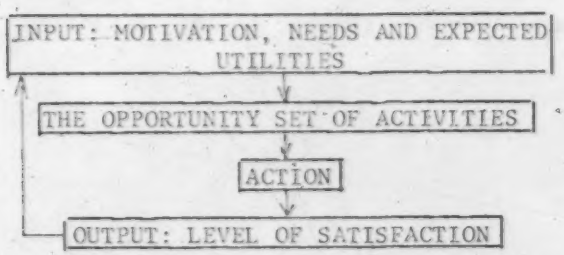

INPUT: MOTIVATION, NEEDS AND EXPECTED UTILITIES
THE OPPORTUNITY SET OF ACTIVITIES
ACTION
OUTPUT: LEVEL OF SATISFACTION

Figure 1-2 A Conceptual Model of Activity Decision

(2) Coupling Constraints. The activity system of the individual can be viewed as a subsystem of the grand activity system of the society. The coupling constraints are the means the society employs to integrate all subsystems within the grand system. Thus, the working hours of most firms are more or less fixed. Services and facilities are provided only in certain periods of the day and in certain parts of the city. The individual has to juxtapose his own activities within the limit set up by the society both in time and space.

(3) Authority Constraints. Hagerstrand points out that there are hierarchies which exist in the social and organizational structure. Thus, an ordinary worker of a firm will not have the same access to the major decision-making procedures as an executive officer. This set of constraints is determined by the social roles played by the individual.

These sets of constraints together define the 'action space'[24] of the individual or any other behavioral system. It is within these limits that potential activities can be undertaken. The abstract space bounded by the aforementioned constraints has a geographical manifestation. With regard to the capability constraints, it defines the biological and technological limits of the individual's movements. For the coupling constraints, the set defines the potential work place, transportation networks, and places of

entertainment as frequented by the individual. With respect to the authority constraints, the preclusion of certain areas from institutional and private uses limits the spatial extent that the individual can reach. Hence, these sets of constraints also define the boundary of the individual's 'geographical action space.'[25]

To substantiate the concept of action sapce, Horton and Reynolds add a 'vertical' dimension, the perceived utility level associated with each location within the boundary defined by the three sets of constraints.[26] Several studies have demonstrated the validity of the concept in explaining the migration behavior of urban residents. It is also found that the action spaces of urban dwellers living in a homogeneous sector of the city show a high degree of similarity.[27] In addition, the action space of an individual is found to be related to his micro-geographic environment. Michelson in a study at Metropolitan Toronto, for example, found different patterns of activities between suburbanites and central city dwellers.[28] Although it has not been made explicit in the study, one can assume that it was a result of the smaller amount of time spent on the journey to shopping, social visits and the like by the downtown residents. In a time budget analysis of a medium size German city, Osnabruck, Von Rosenbladlt found that the distance travelled to shopping, services, leisure activities and social visits by the outlying residents all were double those of the inner

city dwellers.[29] From this, it can be inferred that the time allocation pattern of the individual's daily activity routines depends on the relative location where the individual resides. When the time allocated to some of the activities such as working is altered, or when the location at which some of the activities take place is changed, the individual has to adjust the manner in which he engages in other activities both in time and in space as well. That is, the entire action space of the individual is shifted. However, since not all activities are of the same degree of importance to the individual, the adjustment may not be apparent if only a few of the non-fundamental activities are disturbed. For example, the reduction in the time spent on sun tanning as a result of increased shade due to high-rise apartment developments in the individual's neighborhood is unlikely to have any effect on his work hours. Nevertheless, dissatisfaction in failing to do such activities may be accumulated and may, together with other dissatisfactions with his residential environment, precipitate a change in his residence which will cause a drastic change in his entire activity pattern.[30]

C. The Activity System under Stress

Like most other systems, an activity system is susceptible to environmental disturbance which can either be positive or negative. A positive disturbance on an activity is one that will bring about a higher level of satisfaction or reward to the individual given the same amount of effort or cost in performing the activity. This

may be a result of an increase in the individual's capability or an increase in the reward to the individual in doing the activity concerned. Conversely, a negative disturbance is one that will bring about a reduction in the utility associated with performing the activity.[31] In reality, the environmental disturbance will not be so simple as to affect only a single activity at a time but will have direct effects on a number of activities simultaneously. More complicated still, an environmental disturbance may have positive effects on some activities but negative effects on others. For example, construction of a shopping center in a residential district may reduce the effort involved in shopping but increase the noise level and traffic hazard and thus reduce the satisfaction level associated with activities like relaxation and leisure walking.

Whatever the case, however, an environmental disturbance will result in a state of inequilibrium between the individual's marginal utility attained and the marginal effort or cost in consuming or performing the activity concerned. This state of inequilibrium is referred as 'environmental stress'. Wolpert, following Engel, has defined stress as:

> "Any influence, whether it arises from the internal environment or the external environment, which interferes with the satisfaction of basic needs, or which threatens to disturb the stable equilibrium."[32]

The inequilibrium between what is gained and what is wanted will

in turn bring about psychological strain or uneasiness to the individual. In order to release the strain, the individual may seek external adjustments. In most instances, however, there is a tolerance level such that if the strain is not greater than this level, there will be no external responses.[33] If the stress or the inequilibrium is so great that the psychological strain exceeds the tolerance limit, two essential forms of response can be identified:[34]

(1) Passive Response. Different responses will result from different environmental stresses. First, if the stress is brought about by a positive disturbance, the individual would tend to engage more often in those activities being affected. In addition, he may seek easier access to the agent that is responsible for the disturbance or stress. For example, if he thinks that downtown entertainment is of great importance to his well being, he may choose the city center as the place of residence. On the other hand, if the stress is brought about by negative disturbances, the individual may seek isolation from the stress inducing agent. One way to accomplish that is to do the same activity at a different time and place so as to avoid the effect of the stress. Thus, if a shopping center is constructed in his neighborhood, the individual may keep his children from playing outside the dwelling because of the increased traffic hazard; or he may advise his children to play outside only when traffic is light. An extreme form of isolation behavior is manifested

in terms of intra-urban migration. If the individual is very unsatisfied with his neighborhood, say, due to the increase in noise level and traffic hazard as a result of the shopping center development, he may move to a new neighborhood where he can maintain the activities which he desires such as leisure walking or relaxation. But a move is costly and would be taken only rarely.[35]

As has been mentioned, an environmental disturbance may have different effects on different activities simultaneously. It is therefore not usual to find an environmental stress that is purely positive or negative in nature. To analyze the effect of the stress, a diagrammatic analysis is attempted here. Three categories of environmental stress can be envisioned. First, there are the ones that bring about a higher equilibrium level of satisfaction or the ones that are essentially positive (Figure 1-3a). Second, there are stresses that result in a lower equilibrium level of satisfaction or stresses that are essentially negative (Figure 1-3b). Third, there are also the ones that do not have any effect on the equilibrium level of satisfaction (Figure 1-3c).

Although the activities being affected may be numerous, the problem can be simplified by considering two activities at a time only. Let these activities be A_1 and A_2. In the perspective of micro-economic theory, they can be treated as goods consumed by

the individual. The amount of each activity consumed in a given time period is represented by the X- and Y axes respectively (Figures 1-3a, b, and c). C_0 denotes the budget constraint before the environmental disturbance and C_1 represents the new budget constraint. The term budget here includes the monetary expenses as well as the necessary effort put in for doing the activities concerned. Let A_1 be positively and A_2 be negatively affected, that is, the cost per unit of A_1 is reduced while that for A_2 is increased. The reduction in the price ratio of A_1 to A_2 implies an increase in the slope (in absolute term) of the budget constraint. Therefore, C_1 is shown to be steeper than C_0, cutting the latter at point I.

Figure 1-3a shows a case where the individual attains a higher level of utility or satisfaction after the disturbance; that is, a case where the overall environmental stress is positive. Here, the substitution effect, and likely the income effect as well, on the consumption of activity A_1 are positive. That is, more A_1 will be consumed after the disturbance (shown in the diagram as the increase from a to a'). But for activity A_2, the substitution effect is negative while the income effect is likely to be positive. Therefore, the final equilibrium level of A_2's consumption is undetermined.

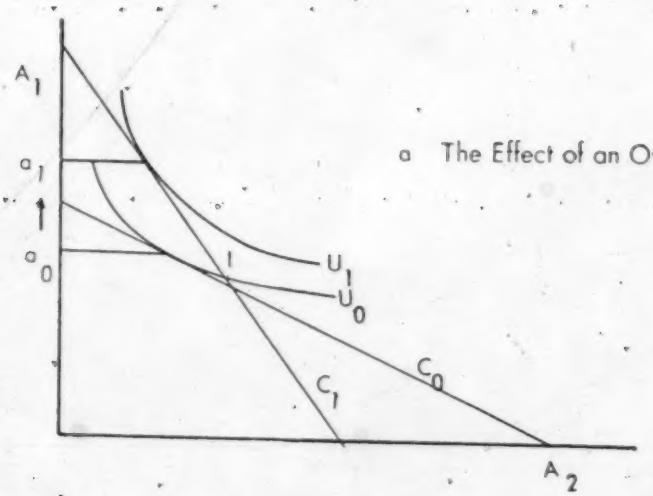
In the second case (Figure 1-3b), the individual's utility level is lowered after the disturbance; that is, the overall stress is negative. For activity A_2, the substitution and income effect will most probably be negative and thus the equilibrium level of A_2 consumed will drop from b to b'. However, for A_1, the substitution

effect will be positive while the income effect will likely be negative; therefore, the final equilibrium level of consumption is unkown.

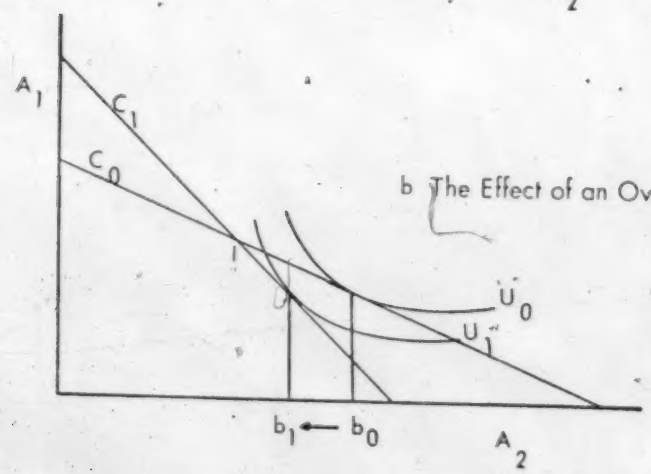
Finally, there is a case where only pure substitution effect is present, that is, the individual still stays on the same level of satisfaction as before. As shown in Figure 1-3c, the consumption of A_1 will be raised from a to a' while that of A_2 reduced from b to b'.

Based on the above analysis, it can be generalized that under an environmental disturbance, those activities that are positively affected will be 'consumed ' or performed more frequently than in the past if the stress is an overall positive one. Conversely, activities that are negatively affected will be performed less often if the stress is an overall negative one, ceteris paribus. Finally, if the stress is overall neutral, those activities being negatively affected will be consumed less while those positively affected will be consumed more often than before. However, neither the signs of change for those negatively affected activities in an overall positive stress nor that for the positively affected activities in an overall negative stress can be predicted from the model.

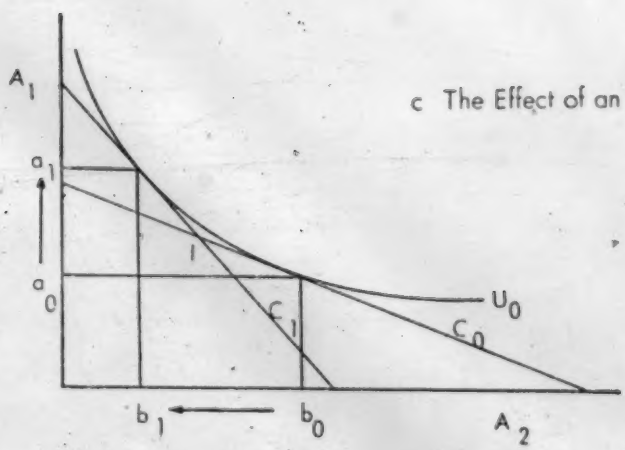
(2) Active Response. Other than allowing the environement to determine his fate, the individual may actively create an environment that is conducive to his survival and well being. For example, the construction of urban highways is of extreme importance to



a The Effect of an Overall Positive Stress



b The Effect of an Overall Negative Stress



c The Effect of an Overall Neutral Stress

Figure 1-3 A Comparative Static Analysis of the Effect of an Environmental Stress on Activity Allocation

the middle and upper class suburbanites whose mobility depends on the automobilies they own. Through the various pressure groups and their representations in government, they have succeeded in building auto-oriented cities throughout North America.

Thus, if the individual sees that the stress as being very advantageous to his activity system, such as the urban highways on his mobility, he may seek every effort to heighten the stress' occurrence. On the other hand, if the stress is having or going to have extremely adverse effects on the individual, he may take aggressive actions against the stress inducing agents.[36] For example, to prevent the destruction of their neighborhoods by the urban renewal programs, the inner city residents may organize to fight against the city government. In some cases, they have succeeded in formulating their own development plans, replacing the ones designed by the city council or some other development agencies.[37]

The active actions in creating or destroying the desired or resented stress are much more sophisticated and costly than the passive ones. They are seldom employed unless the stress concerned brings about enormous impact on the individual. For this reason, the present study will concentrate on the passive types of responses to environmental stress only.

III. Concluding Remarks and the Organization of the Thesis

In the present chapter, some of the studies on the human activity

system have been reviewed and a general analysis of the effects of the environmental stress on the activity system has been presented. This serves as a theoretical foundation in generating testable hypotheses relating to the adjustment processes of the household under an environmental stress: the construction of high-rise apartments in its neighborhood. In the next chapter, theories on urban spatial structure will be reviewed and a discussion on the reasons why high-rise construction is an environmental stress will be given. The third chapter will be concerned with the research design of the present study. The fourth and fifth chapters will be devoted to the analysis of the empirical findings. In the final chapter, there will be a summary of the study, including its theoretical basis, the experimental design and results of the empirical analysis. Hopefully, some insights can be gained in suggesting plausible paths for future inquiry into the human activity system and its relation to the urban environment.

Footnotes

1. See, for example, David Harvey, "Social Processes and Spatial Form." Papers, Regional Science Association. Vol. 25, 1970. pp. 47-69.

2. Gunnar Olasson, "Inference Problems in Location Analysis," in Kevin R. Cox and Reginald G. Golledge (eds.) Behavioral Problems in Geography: A Syposium. Northwestern University Studies in Geography, No. 17, Evanston, Illinois, 1969.

3. J. B. Parr and K.G. Denike , "Structure and Size in the Urban System of Lösch." Economic Geography. Vol. 49, 1973. pp. 186-211.

4. See, e.g., B.J.L. Berry. The Geography of Market Centers and Retail Distribution. Englewood Cliffs, N.J.: Prentice Hall, Incorp., 1967; and W.A.V. Clark and G. Rushton, "Models of Intra-Urban Consumer Behavior and Their Implication for Central Place Theory." Economic Geography. Vol. 48, 1970. pp. 486-497.

5. G. Rushton, "Analysis of Spatial Behavior by Revealed Space Preference." Annals, American Association of Geographers. Vol. 59, 1969. pp. 391-400.

6. It is a study of the household's spatial behavior in the broadest sense of the term. Dickens has argued that spatial behavior are decisions having spatial expression and Schmidlt argues that in situ adjustments of firms to changing milieu is an integral part of the firm's spatial behavior. In both cases a process of relocation or movement may not be involved. See Peter Dickens, "Some Aspects of the Decision Making Behavior of Business Organization." Economic Geography. Vol. 47, 1971. pp. 426-437; and Charles G. Schmidlt, "Changing Milieu and In Situ Adjustment: A Case Study of Pacific Northwest Iron and Steel Firms." The Annals of Regional Science. Vol. 8, 1974. pp. 70-98. See also Guy P. F. Steed, "Changing Milieu of the Firm: A Case Study of a Ship Building Industry." Annals, Association of American Geographers. Vol. 58, 1968. pp. 506-25.

7. P.G. Herbst, "A Theory of simple Behaviour Systems, I." Human Relations. Vol. 14, 1961. p. 75.

8. F. Stuart Chapin, Jr., and Thomas H. Logan, "Pattern of Time and Space Use," in Harvey S. Perloff. Quality of the Urban Environment. Washington: Resources for the Future Incorp., 1969. pp. 305-52.

9. F. Stuart Chapin, Jr., "Activity Systems and Urban Structure: A Working Schema." Journal of the American Institute of Planners. Vol. 34, No. 1, 1968. pp. 11-18.

10. F. Stuart Chapin, Jr. Human Activity Patterns in the City. New York: John Wiley and Son, Incorp., 1974. p. 33.

11. Chapin, op. cit., footnote no. 9.

12. Herbst, op. cit.

13. F. Stuart Chapin, Jr. and R.K. Brail, "Human Activity Systems in the Metropolitan United States." Environment and Behavior. Vol. 1, No. 2, 1969. pp. 107-30.

14. Ibid.

15. Ibid. See also Kirstein Simonson, "Studies of Household Activity System Pattern and Urban Structure." Geografisk Tidskript. Vol. 73, 1974. pp. 26-35.

16. James Anderson, "Space-Time Budgets and Activity Studies in Urban Geography and Planning." Environment and Planning. Vol. 3, 1971. pp. 353-68. Ullman has also revealed the interdependency of space and time and pointed out that words and concepts describing space and time are often interchangeable. See Edward L. Ullman, "Space and/or Time: Opportunity for Substitution and Prediction." Transactions, Institute of British Geographers. Vol. 63, 1974. pp. 125-39.

17. This includes the areas which the individual has direct physical and visual contacts with. See Frank E. Horton and David R. Reynolds, "Effect of Urban Spatial Structure on Individual Behavior." Economic Geography. Vol. 47, 1971. pp. 36-48; and Gary K. Higgs, "Towards a Theory of Human Contact Zone Size." The Professional Geographer. Vol. 27, No. 1, Feb., 1975. pp. 48-51.

18. Herbst, op. cit., p. 76.

19. Robert H. Nelson, "Accessibility and Rent: Applying Becker's Time Price Concept to the Theory of Residential Location." Urban Studies. Vol. 10, 1973. pp. 83-86.

20. The concept of satisficing as put forward by Herbert Simon has been criticized by a number of authors as both theoretically ambiguous and empirically barren. However, there are still quite a number of geographers and non-quantitative economists who think that it is a more empirically relevant concept than maximizing. See, for example, David Harvey, "Conceptual and Measurement Problems in Cognitive-Behavioral Approaches to Location Theory," in R. Golledge and K. Cox, op. cit., pp. 35-68; and Julian Wolpert, "Behavioral Aspects of the Decision to Migrate." Papers, Regional Science Association. Vol. 15, pp. 159-69.

21. Jans Kofoed, "Personal Movement Research: A Discussion of Concepts." Papers, Regional Science Association. Vol. 26, 1970. pp. 141-55.

22. Torsten Hagerstrand, "What About People in Regional Science." Papers, Regional Science Association. Vol. 26, 1970. pp. 7-21.

23. Allan Pred. Behavior and Location: Foundation for a Geographic and Dynamic Location Theory, I. Lund Studies in Geography, Series B. No. 27, 1967. Lund, Sweden: C.W.K. Cleerup.

24. Herbst, op. cit., p.79.

25. In geography, the term 'action space' refers to 'geographical action space' and is the mapping of the abstract space on the surface of the earth. This convention will be followed hereafter unless stated otherwise.

26.Horton and Reynolds, op. cit.

27. Horton and Reynolds, ibid. Lawrence A. Brown and J. Holmes, "Search Behavior in an Intra-Urban Migration Context: A Spatial Perspective." Environment and Planning. Vol. 3, 1971. pp. 307-26. R.J. Johnston, "Activity Spaces and Residential Preferences: Some Tests of the Hypothesis of Sectoral Mental Maps." Economic Geography. Vol. 48, 1972. pp. 122-211.

28. William Michelson. The Place of Time in the Longitudinal Evaluation of Spatial Structure by Women. Toronto: University of Toronto, Centre for Urban and Community Studies. Research Paper, no. 61, 1973. The average time spent in gardening and animal care is given in Table 3 of the monograph.

29. Berhard von Rosenbadlt, "The Outdoor Activity System in an Urban Environment," in A. Szalai. The Use of Time. The Hague: Mouton, 1972. p. 474.

30. See, e.g., F. S. Chapin and T.H. Logan, op. cit., footnote no.8; Chapin, op. cit., footnote 9, and Kofoed, op. cit., footnote 21.

31. Herbst, op. cit, p. 89.

32. Julian Wolpert, "Migration as an Adjustment to Environmental Stress." Journal of Social Issues. Vol. 22, 1966, p. 93.

33. Ibid., p. 94. See also Stephen M Golant, "Adjustment Process in a System: A Behavioral Model of Human Movement." Geographical Analysis. Vol 3, no. 3, 1971.

34. Herbst, op. cit., p. 89.

35. Brown and Moore argue that the individual will seek relocation only after in situ adjustments have proved to be unsatisfactory. See Eric G. Moore and Lawrence A. Brown, "The Intra-Urban Migration Process: A Perspective." Geografiska Annaler, Series B. Vol. 52B, no. 1, 1970.

36. Herbst, op. cit., p. 90.

37. For example, Julian Wolpert, Anthony Mumphrey and John Siley, Metropolitan Neighborhoods, Participation and Conflict over Change. Commission on College Geography, Association of American Geographers, Resource Paper, No. 16, 1972. Washington, D.C.

CHAPTER TWO

HIGH-RISE APARTMENT DEVELOPMENT AS AN ENVIRONMENTAL STRESS

I. The Residential Location Pattern

It was pointed out that the present study aims at investigating the adjustment process exhibited by the individuals and households with respect to their activity systems under environmental stress. The stress to be examined is the changes in the neighborhood residential environment brought about by high-rise apartment developments. The nature of such a stress will be discussed in this chapter. First, some of the traditional theories on urban spatial structure will be reviewed. It is hoped that some insights can be gained towards the understanding of what constitutes an environmental stress in an urban neighborhood.

Stress has been defined as "any influence.....which disturbs or threatens to disturb the stable equilibrium of a system."[1] In reality, the number of disturbances in the environment is numerous and the system is likely to undergo a constant state of change. Hence, a stable equilibrium would hardly exist. However, the concept is a very fruitful one in generating theoretical structures of the system. As far as the urban system is concerned, theoretical structures under equilbirium conditions have been developed by a

number of authors. Essentially, they all postulate an urban area consisting of "a set of neighborhoods or territories, the inhabitants of each neighborhood exhibiting greater similarity to one another than to the residents of other neighborhoods."[2] The postulated homogeneous characteristic of urban neighborhoods applies not only to the social profile of the inhabitants but also to other aspects of the neighborhood environment, such as the type of land use activities. Harris and Ullman, for example, have argued succinctly that like groups of activities would cluster while unlike groups tend to be detrimental to, and thus segregated from, each other.[3] Hence, the resulting theoretical structure of the city will be composed of areas having similar sorts of people as well as similar types of land uses.

For residential land uses of the urban area, the postulated characteristic of neighborhood homogeneity is a direct outcome of the assumed utility maximizing behavior of the inhabitants of the city. Alonso[4], for example, argues that the individual household has to maximize its utility level as derived from the accessibility of its residential location to the center of the city, the amount of land consumed, and the consumption of other goods and services which the household desires. Given the above objective and the constraint of the family income, Alonso derives a set of bid rent functions for each household in the urban area. The bid rent

reflects the household's willingness to pay for each unit area of land at a given distance from the city center. Following Hoover and Vernon,[5] Alonso hypothesizes that the poor people will have a steeper bid rent curve than the well-to-do, reflecting the greater value they place on accessibility to the city center where jobs are traditionally located and the relative importance of transportation cost in their expense allocation. On the other hand, the rich people will tend to value spaciousness and other site amenities. Since they can consume more land in the outskirts of the city where land is relatively cheap, the rich will tend to have a more gentle bid rent function. At equilibrium, competitive bidding among households will result in a Burgess type of land use pattern in which the poor people concentrate in the inner part of the city where land is expensive while the rich reside in the outlying areas where rent is relatively low. That is, the competitive economy will allocate similar sorts of people in the same concentric ring.

Since Alonso selects the distance to the city center as the sole variable describing the accessibility characteristic of residential locations; and since other site amenities are assumed to be constant over the entire urban area, the theoretical pattern derived is ring-like. Had other aspects of the site and situation characteristics of the locations been incorporated into the model, a more complicated pattern would likely emerge. Such attempts have been undertaken by several writers; for example, the works by

Nelson[6] and Tiebout[7]. Tiebout's model is conceptually rather simple and appears to be appropriate to the present situation. The model is outlined as follows.

First, Tiebout assumes an urban area having an arbitrarily large number of neighborhood communities. Second, every individual is assumed to have perfect knowledge of the entire urban area. Third, the individual can change his place of residence freely, that is, the cost of relocation is set to be zero. Under such circumstances, Tiebout hypothesizes that each of the individuals will reside in the community that satisfies him most. If some of the inhabitants in the city do not find a community that is desirable to them, new ones can be created. Hence, the individual can avoid living in those neighborhoods having 'undesired' people or land uses. It is generally believed that people of similar background would have similar tastes and preferences and desire a common bundle of community services and amenities. In addition, their residing in the same area tends to be mutually beneficial or at least compatible. To the upper income people, it may be a way to demonstrate their prestigious status; to the lower income people, it is a way to facilitates mutual aids, and to gain political power.[8] All these factors, together with the assumed perfect knowledge and mobility of the urban dwellers, will bring about an urban area composed of homogeneous neighborhood communities if the urban system is in its equilibrium state. It is also a state

where the utility level of every city inhabitant is maximized, given the limited monetary and other resources that can be employed by the individual.

Although such an equilibrium state may never be reached, the tendency towards neighborhood homogeneity is well documented. For example, the factorial ecologists have given sufficient evidence that people of similar socio-economic status, life cycle characteristics, and ethnic background will occupy the same census tract or enumeration area. This results in "homogeneous areas containing similar sorts of people, areas which were called 'natural' in earlier ecological literature and which are called 'social' today."[9]

It is therefore reasonable to expect that the presence of disturbances in the environment which affect the homogeneity characteristic of residential neighborhoods will lead to a state of inequilibrium in the urban system. In particular, an intrusion of a different kind of people or a different type of land use into a more or less homogeneous neighborhood would alter some of the parameters in the individual's utility function such that the utility level attained is no longer at its maximum or equilibrium. Therefore, the intrusion can be considered as an environmental stress to the residents of the neighborhood. This is the case of high-rise apartment developments in an area previously dominated by

lower residential uses. In the perspective of Tiebout's model, it can be assumed that the inhabitants of the neighborhood do not favor the life style of the people living in the high-rise apartment nor the apartment structure itself. If the urban dwellers are assumed to possess perfect knowledge and ability to move, a process of intra-urban migration will result. Specifically, the present inhabitants of the neighborhood will move away while people who enjoy living in an environment with high density housing will move in. The end of the migration process will be a new state of equilibrium such that the utility level of every urban dweller will once again be maximized.

In reality, relocation is costly and time consuming. The migration process hypothesized is unlikely to be apparent. More probably, the individual would seek adjustments in situ.[10] This includes adjustments in his activity system; the theoretical considerations of which were discussed in the previous chapter More specific hypotheses will be put forward later. Meanwhile, the nature of the environmental stress brought about by high-rise developments will be examined more closely.

II. The Predominant Attitude Towards High Density Living

As Alonso has rightly pointed out, spaciousness is one of the most important variables entering the individual's utility function. Although there is no statistical data available to indicate the

magnitude of its significance, casual observation suggests the majority of people have a great desire for space. Experiemental studies and structured observations by Sommer and his colleagues, in addition, demonstrate that most people place a great value on privacy, and would defend their personal spaces and territories if intruded upon.[11] The great desire for space is paralleled by the resentment of density and crowdedness. It has been noted by Heimstra and McFarling[12] that almost all surveys in housing and environmental quality indicate that high density and crowdedness are among the most important contributors to people's dissatisfaction with their environment; in particular, their urban environment.

The anti-density and anti-crowdedness sentiments are reflected, and probably reinforced, by the voluminous literature on crowding and pathology. First, there are ecological studies focusing on the areal correlation between high density and the various symptoms of pathologies. Schmitt, in one such study, found in Honolulu that there is a high correlation betweem population density and different indices of patholgy, including death rate for all causes, infant death rate and imprisonment rate.[13] Other writers found that mental illness is correlated with population density, whether measured in terms of the number of people per acre or persons per room.[14]

Second, experimental studies on animal behavior under the condition of crowdedness and high density demonstrate the consequence

of 'behavioral sink'.[15] Mersden, for example, observed that when mice raised in a finite cell universe are allowed to expand indefinitely, there is a point where the maximum population is reached. From this point onward, the process of successful reproduction slows down and finally stops. It seems that the entire mice colony will end when all the existing mice are dead.[16]

Third, there are also studies trying to investigate the behavior of human beings under high density and crowded conditions. In particular, there are a large number of studies which aims at contrasting the behavioral patterns in rural and urban environments. The city, with its size, density and heterogeneity, is said to be conducive to various forms of undesirable behavior. Simmel[17] and later Wirth[18] argue that in a densely populated urban environment, formal social control would replace the emotionally held primary relationships of the rural society, such that the urban dwellers would lose the 'emotional quality of life' characterizing the rural society. In addition, Milgrim contends that the urban environment is conducive to 'stimulus overload' which will, in turn, result in a lack of responsibility by urban dwellers.[19]

It has to be pointed out that all these studies do not give a conclusive statment that there exists a causal relationship between density or crowdedness and pathology. High correlations between social patholgy and density can be explained by reasons

other than the one that density causes pathology. For example, there may exist a process which drives out the 'healthier' population while attracting the 'undesired' to the area.[20] In addition, it is very dangerous to extrapolate findings on animal behavior to that of human beings.[21] Moreover, the assumed contrasting behavior of urban and rural dwellers lack empirical verifications.[22] Despite the inconclusiveness of the findings, authors of popular writings seem to believe firmly that high density and crowding will have adverse effects on the individual as well as the human society. Zlutnick and Altman, for example, surveyed a selection of popular magazines over a ten years span and "uncovered a veritable unending source of 'expert' opinions on the effect of crowding on human behavior."[23] This includes propositions that high density and crowding will lead to pollution of the environment, loss of freedom, deterioration of education and services, high crime rates, economic stress, and other undesirable consequences.

Since the anti-density, crowdedness and urban sentiments are shared by so many authors, including scholarly writers as well as authors of popular writings, the influence of such feelings on the general public would be substantial, although the magnitude of influence cannot be assessed in quantitative terms. Strauss[24] and White and White[25] suggest that anti-density and anti-urban feelings are prevalent in the society. They further argue that these

feelings can be traced back to people's romantic memory of their rural origin. The anti-density and anti-urban sentiments probably culminate in Frank Lloyd Wright's version of future cities.[26] According to Wright, the assumed pathological syndrome of the densely populated urban area can only be cured by decentralizing the city, such that every person can occupy a living space of at least one acre. Such resentments against density and crowdedness are probably shared by a large proportion of the population and can be revealed by the rapid suburbanization which has been characterizing North American cities for the past few decades.[27]

In an atmosphere dominated by such anti-urban and anti-density sentiments, it would not be surprising to find that high-rise apartments, being the most conspicuous form of high density housing structures in urban areas, have been subject to severe criticisms by both professionals and general public alike. For instance, it is pointed out by Stevenson and his colleagues that even among professionals such as city planners and housing authorities, from whom less emotional feelings would be expected, there are statements that high-rise apartments are 'gaols in the sky' and 'prisons for the family'; and that high density housing would 'produce family breakdown, delinquency and a variety of social problems.... and provide a bad environment to raise children', and that 'people are thrown to dangerous idleness when they have no

garden to tend'.[28] The generally held negative attitude towards high-rise apartments is partly confirmed by a survey conducted by Graham and others in Metropolitan Toronto.[29] The authors studied a sample of low and middle rent high-rise apartments and found that the community and housing authority tend to think that families in high-rises are transient; have 'no root' and 'no commitments to the environment'; possess 'no comcept of ownership of property'; and are 'cut off from their neighborhoods.' In addition, the lack of space in each apartment unit was believed to have bad effects on children, leading to poor academic performances and a high drop-out rate.

The above findings reflect primarily the opinions expressed by the housing authorities. There lack empirical investigations on the feeling towards high-rise residential developments as expressed by the ordinary individuals. In order to find out how an individual feels about if high-rise apartments are constructed in his proximity, a questionnaire survey was carried out by the author of this thesis. The respondents were householders living in neighborhoods that had experienced high-rise developments. A more detailed discussion on the location of the sampling areas and the problems envountered during the survey will be given in the next chapter. Meanwhile, the discussion will be restricted to the findings on the respondents' attitude towards high-rise apartments in their neighborhood.

Table 2-1

Neighborhood Householder's Attitude towards the Effect of Highrise Apartment Developments on Their Daily Life

Attitude	Frequency of Occurrence
Negative	42(53%)
Positive	2(3%)
Neutral	16(21%)
No Opinion Expressed	18(23%)
Total Number of Questionnaires Returned	78(100%)

The questionnaire used in the survey is given in the appendix.[30] A content analysis of the answers to some of the open-ended questions was performed. These questions are: (1) "please explain how the high-rise development is related to your intended move;" (2) "in what other ways have the high-rise developments in your neighborhood affected you or your family's daily activities;" and (3) the respondents' comments on the present study. The result reveals that out of 78 questionnaires returned, 42 had negative, 2 positive and 16 neutral attitudes expressed by the respondents towards high-rise developments in their neighborhood.[31] (Table 2-1) This indicates that high-rise apartment development is considered by most of the respondents as an environmental threat. A closer examination of the answers suggests that they can be classified into the following categories:

(1). Opinions related to the social environment of the neighborhood. These include the following subcategories:

a. High-rise residents are transient and irresponsible and thus endanger the neighborhood's security.

b. High-rises intrude on privacy.

c. High-rises have adverse effects on children.

d. High-rises block social interaction.

(2). Opinions related to the physical environment of the neighborhood These include:

a. High-rises are responsible for the unbearable noise

level and traffic congestion, especially problems in finding parking spaces.

b. High-rises ruin the physical landscape, reduce the amount of sunshine and bring in other adverse effects on the physical environment of the neighborhood.

The above classification system applies to statements showing negative feelings towards high-rise developments. It is not exhaustive in the sense that some of the answers, such as high-rise developments are 'responsible for tax increases' do not fall into any of the listed categories. Fortunately, these answers only account for a small proportion of the replies and do not distort the picture too much.

Besides this set of responses, there are also two returned questionnaires which express positive feelings. One is related to the increase in accessibility to services due to the greater demand generated by the influx of people, the other to the increase in the opportunity to meet more people.

The frequency that each category of responses has been mentioned by the respondents is listed in Table 2-2. It can be seen that the greatest concerns with high-rise developments by the neighboring residents are the associated undesirable changes in their physical and social environment, although there are few respondents who possess positive feelings towards this type of housing development.

Table 2-2

A Typology of Neighborhood Residents' Attitude towards Highrise Developments

Attitude Type	Frequency
Negative Attitudes	42
(1) Related to the nieghborhood's social environment	
Highrise residents are transient	10
Highrise intrudes privacy	4
Highrise has adverse effects on children	4
Highrise impedes social interaction	5
(2) Related to physical environment of the neighborhood	
Highrise is responsible for the noise and congestion	22
Highrise ruins the landscape of the neighborhood and brings about other adverse effects on the neighborhood's physical environment	16
Positive Attitudes	2
Highrise tends to increase accessibility to services	1
Highrise gives more chance to meet people	1

Note that the total number of negative replies does not add up to 42 because some respondents indicated a number of opinions.

The size of the sample is rather small. Furthermore, the grouping of the responses is quite subjective. Nevertheless, the content analysis of the open-ended questions does suggest that a large proportion of the neighboring residents think that highrise apartment developments present an environmental threat to their neighborhood. First, high-rise dwellers are thought to be a sort of people who might endanger the neighborhood's safety, quietness and privacy. Second, the development of high-rise apartments is thought to be responsible for the ruination of the landscape, increased crowding, and heavier traffic. It can be inferred that to the previous inhabitants of the neighborhood, high-rise developments pose a type of land use that is incompatible with the lower density residential uses previously characterizing the area.

III. The Neighboring Residents' Responses to High-rise Developments

After examining the nature of high-rise developments as an environmental stress to the neighboring residents, some of the possible responses to the stress will be discussed in this section. In correspondence with the framework given in section II of Chapter one, the present discussion will be divided into two subsections. First, some of the active responses, that is, those attempts to restructure the environment in the subject's own

favor, that have been undertaken by a few of the neighborhoods in the past will be reviewed. Secondly, based on the theoretical framework developed in the first chapter, hypotheses regarding the neighboring householder's adjustments to the stress in terms of altering his daily activity routines will be formulated. These hypotheses are tested against the empirical data collected in the survey, the results of which will be given in a later chapter.

A. Active Response to the Environmental Stress

Past studies and the survey data (Table 2-1 and 2-2) suggest that attitudes towards high-rise developments by the neighboring households are predominantly negative. Sometimes, their attitudes may even be antagonistic. It was indicated in the last chapter that the individual may react actively to a stress by restructuring the environment in his own favor. In the case of high-rise developments in residential neighborhoods, the inhabitants of the threatened area may organize to prevent any changes in the zoning by-laws, to stop any future projects of high-rise construction in their neighborhood, or to seek other measures to minimize the supposedly adverse effects of high-rise construction, such as pressing the city government to restrict on-street parking and prevent through traffic in the neighborhood streets.

The literature on citizen participation reveals that some of the neighborhoods threatened by high-rise development projects have been organized to fight against future high-rise construction in the areas concerned. Some of these attempts failed but others have succeeded.[32] For example, a massive high-rise development project was planned for St. James Town in Toronto. The area's inhabitants opposed the plan and organized themselves to delay realization of the project for a few years. However, they finally conceded and the single family structures were replaced by high-rise apartment blocks.[33] On the other hand, the residents of Canora, one of the older residential districts of Edmonton fared better in their struggle against high-rise developments in their neighborhood. They organized an action committee and succeeded in formulating a general plan for the area's redevelopment in their own favor.[34] Even in areas already dominated by high-rise apartments, as in the case of Oliver in Edmonton, the neighborhood may get organized to stabilize the redevelopment process. Sometimes, the neighborhood action groups may even be joined by people living in the high-rise apartments also.[35]

B. Passive Responses to High-rise Developments

Although it is possible for the neighborhood households to react actively to high-rise developments through group actions, it requires a degree of sophistication and level of organization

that only few neighborhood groups can attain. It is therefore almost impossible for any single household to pursue positive responses against the environmental stress concerned. More likely the individual household will react passively. One way to do so is to seek adjustments in their daily activity patterns.

It has been pointed out in Chapter One that the individual's choice of activities is limited by the capability, coupling and authority constraints which define the individual's action space. It is only within the action space that the individual can choose among alternative activities in order to maximize his expected utility. If an environment disturbance on the individual's activity system does not affect these sets of constraints, the opportunity set of workable alternatives will remain the same. The effect of the stress on the activity system can be studied by examining the original categories of activities only. It has been noted that the capability constraints represent the biological ability of the individual and the technological know-how of society. The coupling constraints are the means the society uses to integrate all the activity subsystems within the society's grand system. Finally, the authority constraints are determined by the social roles played by the individual. It is highly unlikely for these constraints to be affected by the changes in the individual's residential environment. Furthermore, activities that are obligatory to the individual, such as working, would probably not be affected by high-rise developments in the individual's

neighborhood. Therefore, only those discretionary or free time activities that used to be carried out by the individual and his family will be considered in this thesis.

In order to analyze how high-rise developments affect the discretionary activities of the individual and his family, the broad category of discretionary activities is subdivided into finer categories. The present classification scheme is a modification of Chapin and Brail's system[36] used in their analysis of the time allocation patterns in 48 United States metropolitan centers. It is felt that the activities listed cover most of the discretionary activities pursued by the households. Further, the classification is thought to be fine enough to suit the purpose of the present research. The activity categories used in this study are:

(1). In-home activities.

a. Socializing with neighbors at home.

b. Socializing with friends other than neighbors at home.

c. Sports and relaxation in the courtyard or garden or on the street in front of the dwelling.

d. Family gatherings, e.g., eating and T.V. watching, inside the dwelling.

e. Family gatherings, e.g., picnics or suppers, in the yard or garden.

f. Reading and relaxation inside the dwelling.

g. House upkeeping.

h. Garden and yard upkeeping.

(2). Out-of-home activities.

a. Visiting in the neighborhood.

b. Visiting friends outside the neighborhood.

c. Shopping in small neighborhood grocery stores.

d. Shopping outside the neighborhood.

e. Family outings, e.g., picnics, movies, etc.

f. Participation in neighborhood associations.

The choice of the classification system is based on a number of considerations. First, the change in the neighborhood environment due to high-rise apartment developments is likely to have greater impact on the in-home activities than activities done outside the subject's home range.[37] Thus, the discretionary activities engaged in by the subject are first subdivided into 'in-home' and 'out-of-home' activities.

It has been pointed out that high-rise developments will bring about an increase in population density, which is associated with an increase in traffic flow and noise level in the neighborhood. Past studies show that high-rise apartment dwellers tend to have a high rate of residential mobility.[38] The construction of high-rises thus implies an influx of people with transient characteristics. Such changes in the environemnt of the neighborhood would probably have different effects on the activities that are

performed inside and outside the subject's dwelling. Therefore, the present classification system differentiates in-home activities (c) from (f) and (d) from (e). More specifically, it is thought that the changes in the residential environment of the neighborhood would have negative effects on the activities 'sports and relaxation in the courtyard or garden or on the street in front of the dwelling', and 'family gatherings, e.g., picnics or supper in the yard or garden' because of the increase in noise level, loss of privacy, reduction in safety and other supposedly adverse consequences associated with the high-rise development in the subject's neighborhood. On the other hand, the activities performed inside the dwelling, i.e., the categories 'reading and relaxation inside the dwelling', and 'family gatherings, e.g., eating and T.V. watching, inside the dwelling', would not be affected as much by the changes in the subject's residential environment.

Past studies suggest that the individual would have different social relations with his neighbors and friends.[39] Thus, socializing with neighbors and socializing with friends outside the neighborhood are listed separately. The changes in the neighborhood environment is thought to have little or no effect on 'visiting friends outside the neighborhood'. However, it is believed that the high-rise apartment development would have negative effects on the other three categories of socializing activities; that is, (a) and (b) of the in-home activities and (a) of the out-of-home

activities. First, it is unlikely for the individual to establish close relationships with the incoming high-rise residents because of their transient nature. Second, the increase in traffic flow and noise level would likely make socializing activities among neighbors such as chatting across fences less desirable than before. In addition, some of the subject's old neighbors with whom he has established close social relationships might have moved away as a result of their dissatisfaction with the new environment. All these factors would lead to a reduction in the satisfaction obtained from either 'socializing with neighbors at home' or 'visiting in the neighborhood'. Also, the increased noise level and traffic may affect the individual's degree of satisfaction in 'socializing with other friends at home.' For example, the visitors may have problems in finding parking spaces due to the increased population density in the neighborhood.

Fourthly, the category 'house upkeeping' is intended to include household works and house maintenance. The survey data indicate that a large proportion of the respondents think that high-rise developments would result in a less beautiful landscape (Table 2-2). This may have an externality effect such that the neighboring householders would be less willing to keep up his house. However, this effect might be insignificant. In order to live comfortably, the householder and his family need to keep up his dwelling, especially internally. The hypothesized externality may affect his willingness to keep up the yard and the garden also.

Since yard and garden upkeep relates directly to the landscape beauty of the neighborhood, the effect of the high-rise developments on this category of activities is likely to be more apparent.

Fifthly, it has been pointed out that some individuals prefer high-rise developments because of the associated increase in accessibility to services. Since most of the ground floor shopping facilities provided by the high-rise apartments are small enterprises, such as groceries and drug stores, a broader activity cetgory, 'shopping', which is used in most time budget studies is broken into 'shopping in neighborhood grocery stores' and 'shopping outside the neighborhood'. Since the effort required to purchase grocery items will be reduced and thus the utility in engaging in this activity will be increased, 'shopping in neighborhood grocery stores' is affected positively by the high-rise apartment developments. On the other hand, the change in the neighborhood environment is unlikely to have a direct effect on the category 'shopping outside the neighborhood.'

Sixth, following Chapin and Brail,[40] family outing is listed as one of the out-of-home activities under investigation. Since this activity takes place outside the individual's neighborhood, it is unlikely to be affected by the neighboring high-rise construction.

Finally, it has been suggested that the neighborhing residents may organize themselves to prevent future high-rise apartment

development projects. Hence, greater involvements in the neighborhood associations would be expected. However, at the same time, the presence of an 'undesired' transient population in the neighborhood may have a negative effect on the participation rate in the neighborhood associations. Specifically, the residents of the neighborhood may not identify with their neighborhood as much as before the high-rise construction and become less involved in the neighborhood affairs. In order to investigate the relationship, the category 'participation in neighborhood associations' is included in the present classification system.

The above discussion suggests that high-rise apartment developments would have negative effects on activity categories (a), (b), (c), (e) and (h) of the in-home activities and category (a) of the out-of-home discretionary activities. In addition, the effect on (c) of the out-of-home activities is likely to be positive. For the other activities, the effect of high-rise developments would be less direct.

It has been argued that to most householders, the stress brought about by high-rise developments is essentially a negative one. By means of a diagrammatic analysis, it was shown that, under a negative stress, the utility maximizing individual will, ceteris paribus, allocate less time to those activities which are negatively affected by the stress. In other words, the individual

engages less frequently in those activities from which he can derive less satisfaction when the same amount of effort is put in as before. The theoretical deduction leads to the following hypothesis.

HYPOTHESIS I. The individual will, ceteris paribus, reduce the time he allocates to the in-home activities (a), (b), (c), (g) and (h) and out-of-home activity (a).

It has also been shown that the direction of change for the time allocated to those positively affected activities cannot be predicted by the model developed in the last chapter. In addition, for those discretionary activities that are not affected directly by the high-rise development, the effect of the stress cannot be specified by the model. However, the total amount of time available for discretionary activities on each day is more or less fixed. It is reasonable to expect the change in the time spent on some of the activities will affect the time allocated to other activities as well. Thus, a second hypothesis can be stated as follows.

HYPOTHESIS II. The time spent on other activities, that is, (d) and (g) of the in-home categories and (b), (c), (d), (e) and (g) of the out-of-home categories will be different from that before the high-rise construction, although the direction of change cannot be specified. From this, it can be inferred that the individual's entire

discretionary activity pattern will be different from before.

IV. Conclusion

In this chapter, the nature of high-rise apartment developments as an environmental stress to the neighboring households has been examined from different perspectives. First, high-rise apartments were suggested to be a type of land use that is different from lower density residential uses. The construction of which in an existing neighborhood may pose an environmental threat to people who have been living in the neighborhood before the high-rise developments took place. Secondly, it was suggested that there is a general dislike of crowdedness and density in the society. However, the construction of high-rise apartments would bring about such an undesirable living environment to the neighboring households. High-rise apartment developments were thus suggested to be an essentially negative environmental stress to the neighboring households. Hypotheses on the household's adjustments to the stress with respect to his daily activity routines were formulated. In the latter part of the thesis, attempts will be made to:

1. test the validity of the basic components of the neighborhood's concern with high-rise developments as suggested by the rather subjective content analysis used in this chapter. In particular,

it was suggested that the changes in the neighborhood's physical and social environment are the greatest concerns to the neighboring households, while the increase in the accessibility to services due to high-rise developments is of minor importance. A more objective analysis will be made to test the above postulation.

2. test the hypotheses on the household's adjustment process with respect to the changes in the daily activit pattern due to the environmental stress concerned.

Footnotes

1. Julian Wolpert, "Migration as an Adjustment to Environmental Stress." Journal of Social Issues. Vol. 22, 1966. p. 93.

2. Kevin R. Cox. Conflict, Power and Politics in the City. New York: McGraw Hill, 1973. p. 18.

3. Chauncy D. Harris and Edward L. Ullman, "The Nature of Cities." Annals, American Academy of Political and Social Sciences. Vol. 242. Nov., 1945 p. 7-17.

4. William Alonso. Location and Land Use. Cambridge, Mass.: Harvard University Press, 1964.

5. Edgar Hoover and Raymond Vernon. Anatomy of a Metropolis. Cambridge, Mass.: Harvard University Press.

6. Robert H. Nelson, "Accessibility and Rent: Applying Becker's Time Price Concept to the Theory of Residential Location." Urban Studies. Vol. 10, 1973. pp. 83-86. A brief discussion of the model was given in Section II of Chapter 1.

7. Charles M. Tiebout, "The Pure Theory of Local Government Expenditure." Journal of Political Economy. Vol. 64, 1956. pp. 416-424.

8. See, e.g., Julian Wolpert, Anthony Mumphrey and John Siley, Metropolitan Neighborhoods: Participation and Conflict over Change. American Association of Geographers, Commission on College Geography, Resource Paper, No. 16, 1972. Washington, D.C.

9. Philip H. Rees. The Factorial Ecology of Metropolitan Chicago. Master's Thesis, University of Chicago, 1963. Reprinted in Brian J.L. Berry and Frank E. Horton. Geographic Perspectives on Urban Systems. Englewood Cliffs, N.J.: Prentic Hall, 1969.

10. Lawrence A. Brown and Eric G. Moore. "The Intra-Urban Migration Process: A Perspective." Geografiska Annaler, Series B. Vol. 52B, No. 1, 1970. The authors argue that there are two phases of adjustment to environmental stress. First, there are in situ adjustments. Second, the individual will seek a new residence. The actual relocation takes place only if in situ adjustments ahve proved to be a failure and the search for a new residence is successful. Hence, migration is rarely undertaken.

11. See R. Sommer. Personal Space: The Behavioral Basis of Design. Englewood Cliffs, N.J.: Prentice Hall, 1969.

12. Norman W. Heimstra and Leslie H. McFarling. Environmental Psychology. Montery, Cal. Brooks/Cole Publishing Co., 1973.

13. Schmitt, Robert C. "Density, Health and Social Organization." Journal, American Institute of Planners. Vol.32, 1966. pp.38-40. See also William Michelson. Man and His Environment: A Sociological Approach. Don Mills, Ontario: Addison Wiley, 1970.

14. Steven Zlutnick and Irwin Altman, "Crowding and Human Behavior," in Joanchin F. Wohlwill and Daniel H. Carson (eds.) Environment and the Social Sciences: Perspectives and Applications. pp.44-55.

15. J. B. Calhoun, "Population Density and Social Pathology." Scientific America. Vol.206, 1962. pp.139-148.

16. Halsey M.Mersden, "Crowding and Animal Behavior," in Wohlwill and Carson, op. cit., pp.5-14.

17. Georg Simmel, "The Metropolis and Mental Life," in Paul K. Hatt and Albert J. Reiss (eds). Cities and Society. New York: Free Press of Glencoe, 1957. pp.635-646.

18. Louis Wirth, "Urbanism as a Way of Life." American Journal of Sociology. Vol. 44, 1938. pp.1-24.

19. Stanley Milgrim, "The Experience of Living in Cities." Science. 13 Mar. 1970. Vol.167. pp.1461-1468.

20. Zlutnick and Altman, op. cit.; and Funter Gad, ""Crowding" and "Pathologies": Some Critical Remarks." Canadian Geographer. Vol. 17, 1973. pp. 373-390.

21. Ibid.

22. Heimstra and McFarling, op. cit., pp. 107-108.

23. Zlutnick and Altman, op. cit., p.49.

24. Anslem L. Strauss, "Urban Perspective: New York City," and "Some Varieties of American Symbolism," in A. L. Strauss. The American City. Chicago: Aldine Publishing Co., 1968. pp.4-18 and pp. 19-35 respectively.

25. Mouton and Lucia White. The Intellectual Versus the City. From Thomas Jefferson to Frank Lloyd Wright. Cambridge, Mass : Harvard University Press, 1962.

26. Ibid., pp. 189-199.

27. See, for example, redrick Allen, "Suburban Nightmare," in Strauss, op. cit., pp. 411-420. Also, John H. Niedercorn and Edward P. R. Meanle, "Recent Land Use Trends in Forty-Eight Large American Cities." Land Economics. Vol. 60, No. 1. 1964. pp. 105-109.

28. Anne Steveson, Elaine Martin and Judith O'Neil. High Living: A Study of Family Life in Flats. Melbourne: Melbourne University Press, 1967. p. 1.

29. Alwyne Graham, Linda Hargarty, Wilson A. Head, Henry Sears, Nalla Sanathirajah and Henry Seyward. Families in Hi-Rise Apartments: A First Study. Toronto: Social Planning Council of Metropolitan Toronto, 1967. pp. 44-48. The term families in this study refers to those nucleated families with children.

30. Three different sets of questionnaires were used in the survey. The one referred to here is the questionnaires sent to the householders living in high-rise neighborhoods. For a more detailed discussion of the questionnaire design, see Chapter 3.

31. Further discussion of the replies showing negative and positive feelings will be given later in the chapter. For those subjects indicating that they are indifferent to high-rise developments or think that such developments have no effects on their daily life, their attitude will be classified as neutral, e.g., "no effect on us."

32. For example, John Lorimer. A Citizen's Guide to City Politics Toronto: James Lewis and Samuel, 1972. p. 4.

33. Ibid., p. 43.

34. City of Edmonton, Planning Department, Residential and Redevelopment Branch. Canora: Neighborhood Improvement. Edmonton: City Council, 1972.

35. Jim Bentein, "Residential Tilt at Highrises." Edmonton Journal. Sept. 18, 1975. p. 13. Edmonton.

36. F. Stuart Chapin, Jr. and R. K. Brail, "Human Activity Systems in the Metropolitan United States." Environment and Behavior. Vol. 1, No.2, 1969. pp.107-130.

37. The home range is the territory that the household will defend for its privacy and security. See Heimstra and McFarling, op. cit., pp.40-44.

38. Graham et. al., op. cit.; and Jacqueline G. Hayter. Residential Mobility and the Function of Seven Highrises in Central Edmonton. Unpublished M.A. Thesis. Department of Geography, University of Alberta, Edmonton, 1973.

39. The relationship between friends is voluntary, intimate and enduring; whereas, neighbors can be a group of people whose relationship may be no more than the spatial propinquity of their residence. Especially in urban neighborhoods, the social relationship among neighbors is generally trivial. See Scott Green, "Neighborhood," and Odd Ramsey, "Friendship," in David L. Sills (eds.) International Encyclopedia of the Social Sciences. Vol. 11. pp.121-125; and Vol. 6. pp.12-13. Crowell Collien and McMillan Incorp., 1968.

40. Chapin and Brail, op. cit.

CHAPTER THREE

THE RESEARCH METHODOLOGY

To test the hypotheses put forward in the last chapter, field survey has to be carried out. The representativeness, reliability and validity of the data thus collected essentially depend on: a). the method of sampling; and b). the design of the research instrument. The exposition of the methodology employed in the present research will be the major concern of this chapter. Since the present study aims at investigating the adjustment process exhibited by the neighboring households as a result of high-rise apartment developments, a brief look at the history of high-rise construction in the city would be helpful, especially towards the selection of the sampling areas.

I. The Context

Edmonton, like most other Canadian cities, was formerly dominated by single family residential structures. In the late fifties and in the sixties, however, it experienced an apartment construction boom. The boom can be depicted in Table 3-1, which shows that prior to 1952, apartment units counted towards only a small proportion of the total housing starts in the city. In the

Table 3-1

Housing Starts in Edmonton

Construction Period	Detached Houses	Apartments
Prior to 1922	9632	681
1922 to 1931	3944	83
1932 to 1941	3134	104
1942 to 1951	17061	1183
1952 to 1961	30886	7091
1962 to 1971	18666	29854
1971 to 1974	11901	5845

Sources: For the periods up to 1971, Lawrence.D. McCann. Changing Morphology of Residential Area in Transition. Unpublished Ph.D. Dissertation, University of Alberta, Edmonton, 1972.

For the period 1972-1974, Statistics Canada, Housing Starts and Completion. Ottawa: Information Canada, 1971-75.

period 1962 to 1971, more than half of the housing starts were apartment units. Although the boom seemed to have come to an end in the recent years, the vigorous apartment construction activities in some of the older residential areas during the boom have left a remarkable imprint on the lanscape of certain parts of the city. A comparison of Figurs 3-1 and 3-2 reveals that some parts of the city have been completely restructured. The first map indicates that few houses were redeveloped into apartment buildings in the period 1952 to 1961. In the period 1962 to 1971, however, there were areas which had more than 20 percent of the housing structure replaced by apartments. The major redevelopment activities occurred around the downtown core and other inner city neighborhoods. Although some of the outlying communities, notably Jasper Place in the west, have also experienced quite an amount of redevelopments.[2] As a result of these redevelopment activities, by 1971, apartments constituted more than 50 percent of the housing stock in a large proportion of the inner city neighborhoods[3] (Figure 3-3).

Certain regularities can be found for the spatial distribution of apartment construction activities. Specifically, the high-rises tend to outbid the walk-ups in the high rent districts, particularly along Jasper Avenue, in the university district, and along both sides of the river valley. In recent years, there were some scattered high-rise apartments constructed in more peripheral

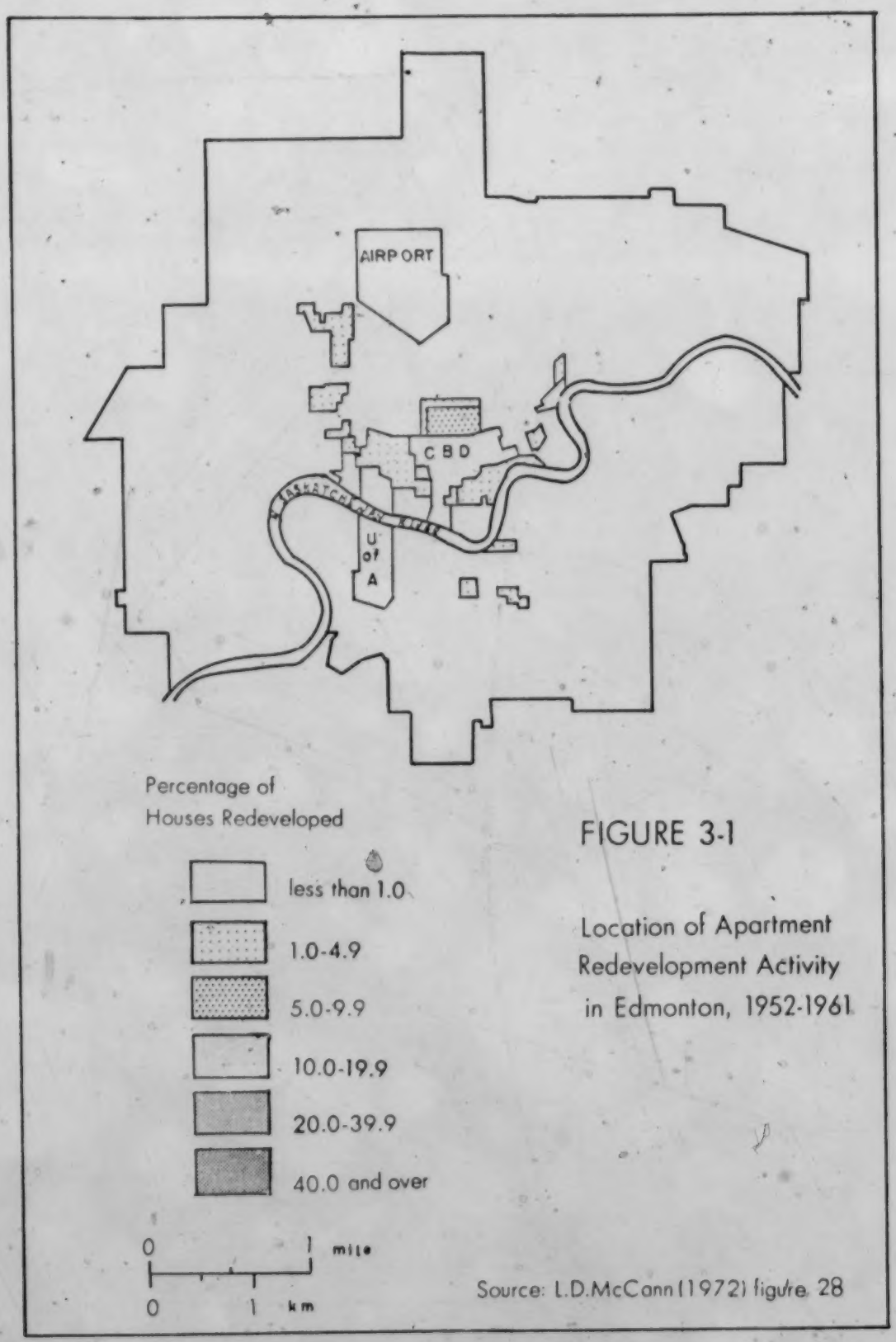


FIGURE 3-1

Location of Apartment Redevelopment Activity in Edmonton, 1952-1961

Source: L.D.McCann (1972) figure 28

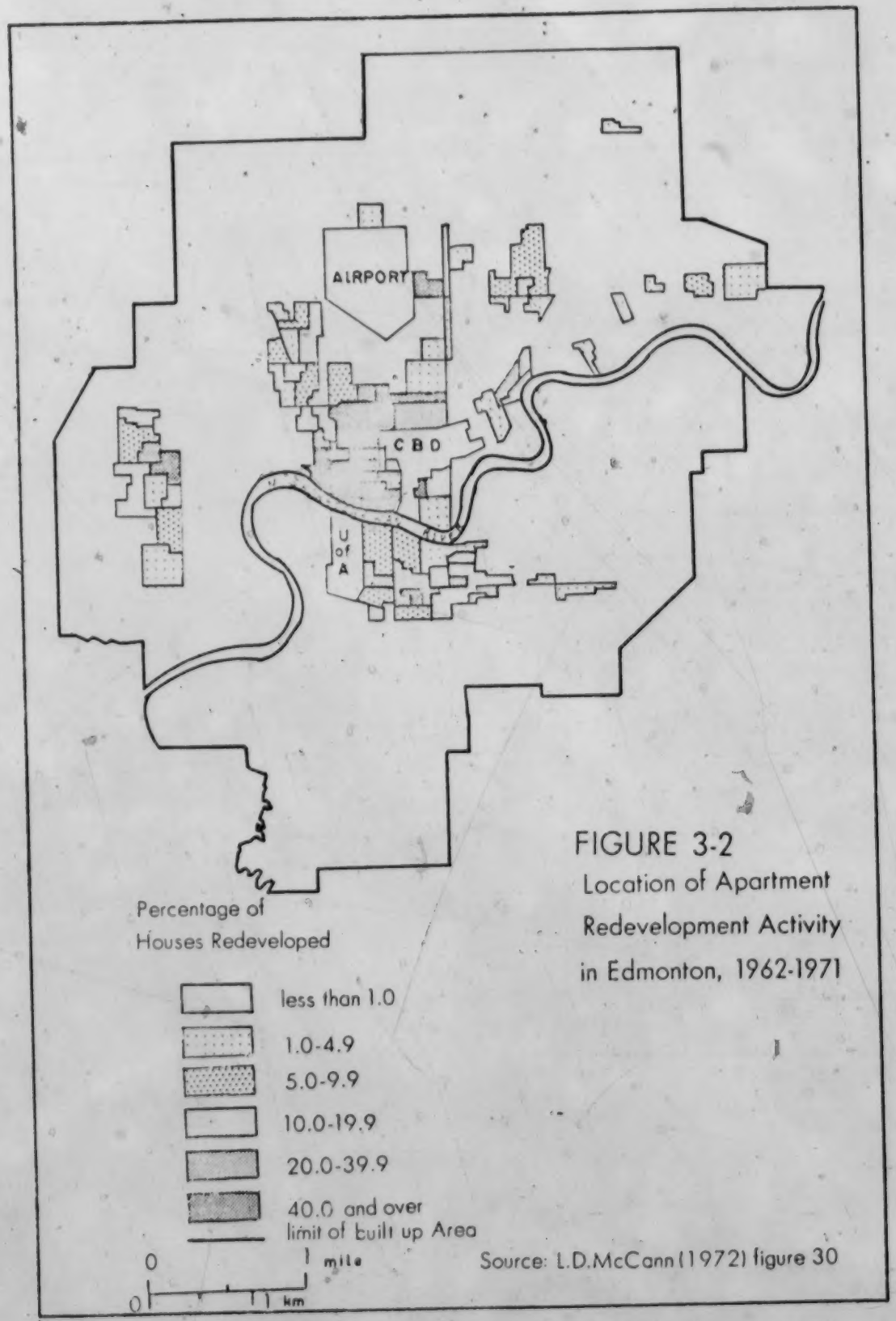
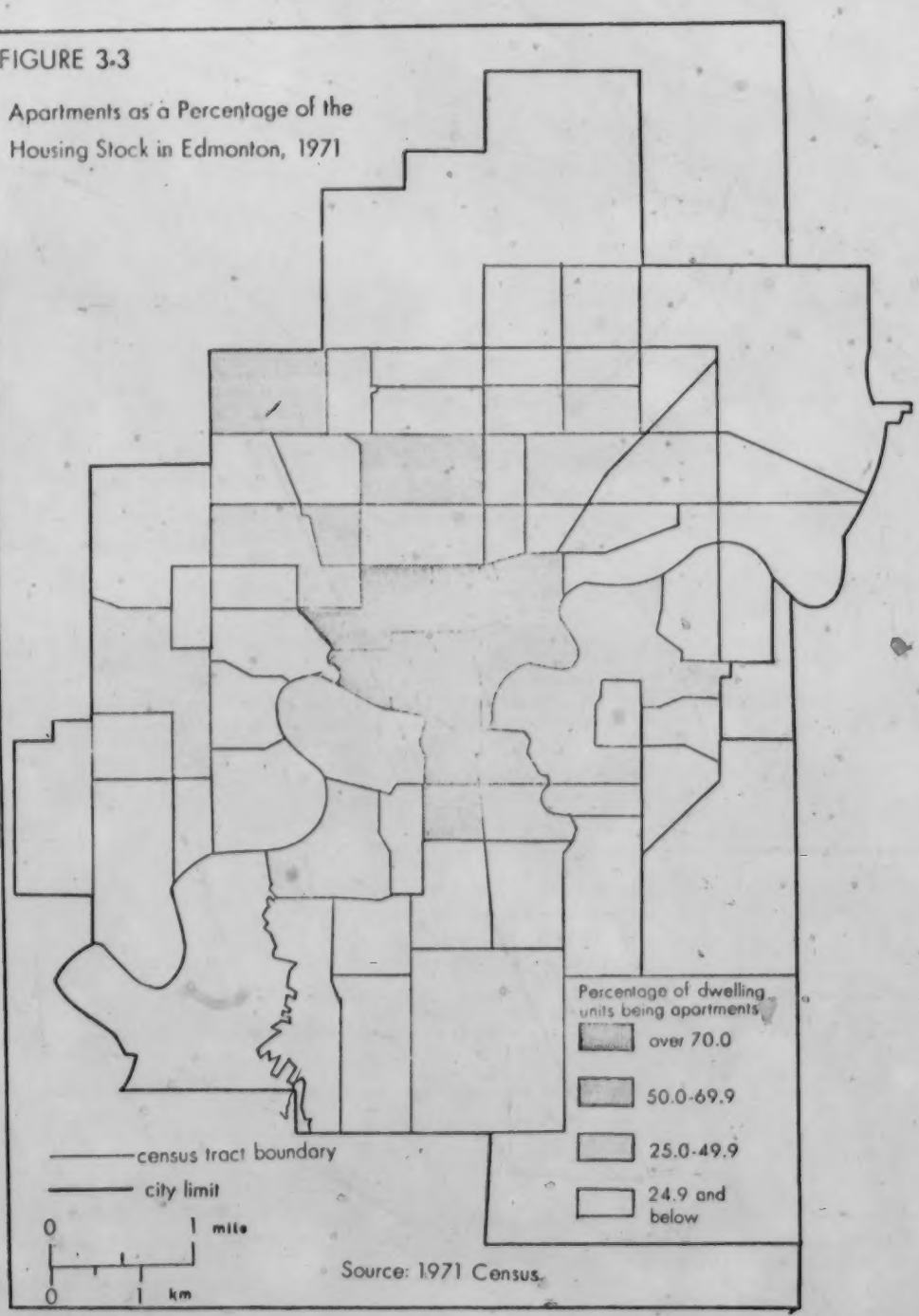


FIGURE 3-2
Location of Apartment Redevelopment Activity in Edmonton, 1962-1971

Source: L.D.McCann (1972) figure 30

FIGURE 3-3

Apartments as a Percentage of the Housing Stock in Edmonton, 1971



districts, for example, Sir William Place on 85th Street and 88th Avenue, and Viking Arms Apartments on 47th Avenue and 106th Street (see Figure 3-4).

The spatial distribution of high-rise apartments suggests that study areas can be selected from the central, university and more peripheral districts to represent the different distance zones from the city center. By means of such a sampling design, the different effects of high-rise developments on neighboring households in different distance zones from the city center can be assessed. This approach is employed in the present study.

Since the first high-rise apartment was built in 1955, there have been, up to 1973, 115 high-rise apartment buildings containing some 12541 dwelling units.[4] (Table 3-2) The survey data suggest that on the average, there are 1.65 persons per household living in a high-rise apartment (Table 4-9). This indicates that this type of housing is providing accommodation for more than 20,000 people. It is therefore a rather important stock of housing in the city . Study of high-rise apartment developments is thus of practical relevance.

II. The Sampling Design

A. General Considerations

The adjustment process exhibited by the household's activity

FIGURE 3-4
DISTRIBUTION OF
HIGHRISE APARTMENTS
IN EDMONTON, 1973

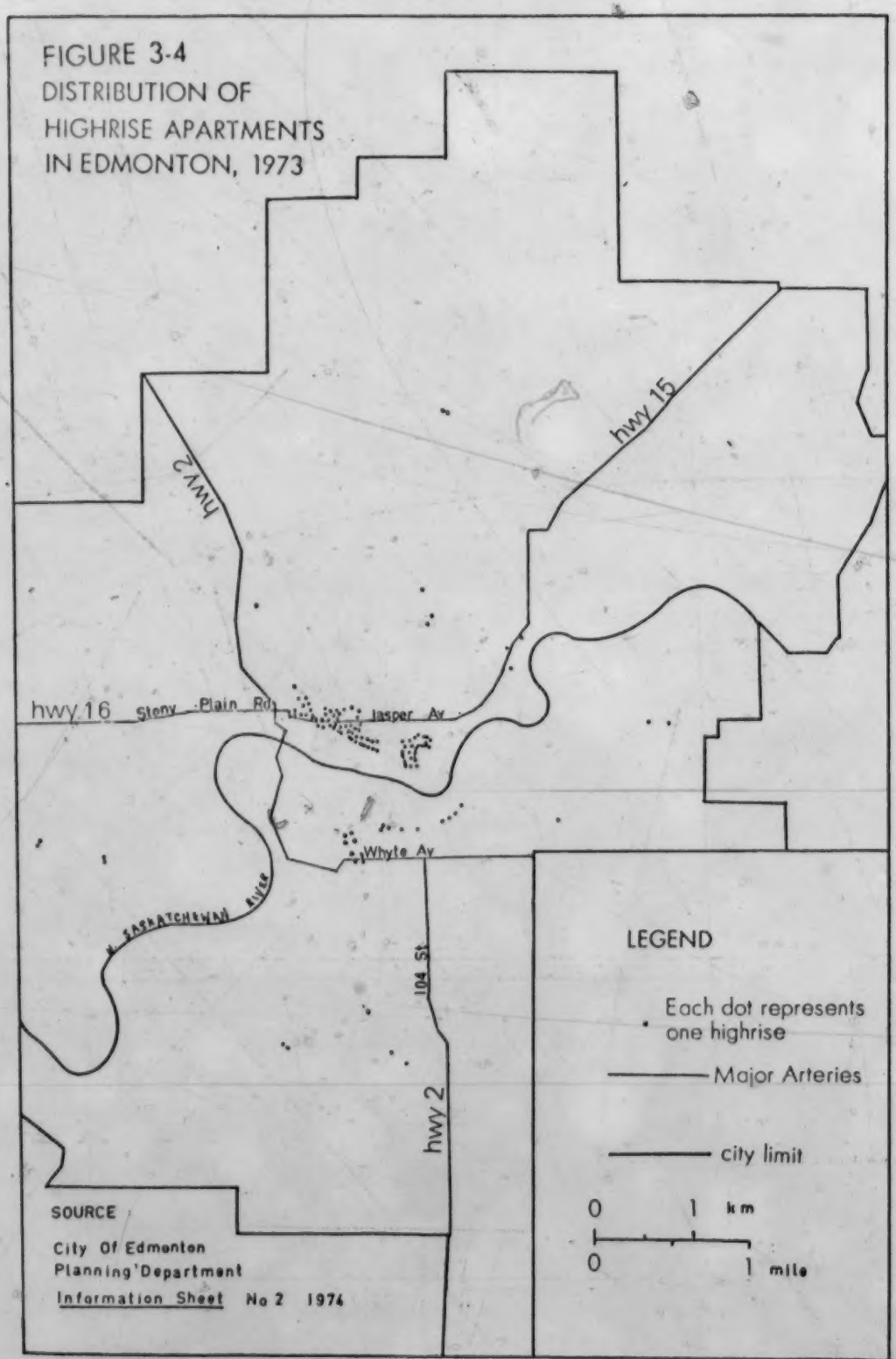


Table 3-2

Highrise Construction in Edmonton

Construction Period	No. of Properties	No. of Suites
1960 and before	2	137
1961 - 1965	27	2416
1966 - 1970	49	4846
1971 - 1973	35	5186

Source: City of Edmonton, Planning Department. Information Sheet, no. 2, March, 1974.

system under stress can be studied by different approaches. The simplest of these is to select householders from certain areas which have experienced high-rise developments and try to investigate their activity patterns before and after the high-rises were constructed in their neighborhood. This method suffers a number of serious drawbacks. In order to compare the subject's activity patterns in the past and in the present, questions on detailed aspects of the householder's time allocation patterns in both periods have to be asked. This requires the subject to possess extra-ordinary power of memory. Therefore, the data thus collected may be unreliable and misleading. More specifically, the subject might exaggerate the differences if he thinks the high-rise development has affected his daily life. Similarly, he might conceal any differences if he thinks there has been no effect on him and his family.

This method was tried during the pretests of the field survey. The attempt seemed to be a failure. The respondents did not want to give estimates of the time they spent each day before the high-rise construction on the activities chosen for the study. Moreover, they were not willing to cooperate when the researcher tried to probe further on their past activity routines. Therefore, other approaches were considered.

One alternative is to approach the problem by a quasi-experimental design. A group of householders living in areas with anticipated high-rise construction can be selected. Their activity patterns are subject to observations throughout a time span of before, during, and after the construction of high-rise apartments. This ensures that any changes in the activity patterns observed are actual changes manifested by the group of households under study. In order to isolate the effect of high-rise development, a 'control group' of households, with similar social background and living in comparable neighborhoods but without anticipated high-rise developments, can be chosen. They are subject to the same observations as the former or 'study' group of subjects. All other environmental factors are thus held constant. Any differences found in the actual patterns exhibited by the two groups can be attributed to high-rise developments in the neighborhood of the study group. It has to be demonstrated, of course, that the two groups had similar activity patterns before the high-rise were constructed.

Although this method appears to possess scientific rigor, it is not practical to carry out in the present context. It is very difficult to foresee areas with anticipated high-rise developments. In addition, the study would have to depend on the behavior of the developer if such a research design is employed. Even if the

problems of finding areas with future high-rise construction are solved, the time required to complete the research is prohibitive because it usually takes a few years before a proposed high-rise apartment is approved and constructed. Moreover, over such a time period, the structure of the households under study would have changed; and some of households may have moved away while others moved in, rendering the comparison between the study and control group meaningless. A rigorous longitudinal approach is therefore impossible.

To avoid the problems associated with the length of the study period and those of finding study areas, a cross-sectional approach is adopted in the present study.[5] Areas with high-rise developments are first selected and households living in those areas are then sampled. Their activity systems are studied and compared to a group of 'control' households. The latter should possess similar socio-economic characteristics and live in neighborhoods comparable to the study group, except that there is no high-rise development. If differences are found in the activity patterns between the two groups, they can be attributed to the stress brought about by high-rise developments.

The major drawback to this method is the difficulties in determining the actual causal linkages. The difference exhibited in the activity patterns may be an outcome of processes other

than the household's adjustment to the stress. For example, the difference may be due to the moving out of people who resent high-rise developments and influx of people who are indifferent to or who desire high-rises in their neighborhood.

In spite of this shortcoming, this method possess significant advantages over the other approaches thus far considered. First, it does not require the subject to recall details of his activity routines that were of some years ago. Moreover, the researcher will not encounter much problem in finding study areas. The discussion on the history of high-rise apartments in the city indicates that the number of existing high-rise apartments in the city is quite large. Furthermore, they can be found in areas representing different distance zones from the city center. Therefore, the effects of high-rise construction on the neighboring household's activity pattern as related to the relative location of the high-rise apartment can be investigated.

B. The Sampling Procedures

1. The Choice of Sampling Areas

To represent three different distance zones from the city center, three study areas were selected for the present research. The first one is located near the downtown area and is denoted as the 'central study area'. The second, the 'university study area,' is close to the university and is chosen to represent all other

inner city neighborhoods of the city. The third one is located in the south side of the city, between 51st and 57th Avenues, and 109th and 111th Streets. Since it occupies a more outlying position, it is denoted as the 'peripheral study area'.

All of these areas were established neighborhoods before there were high-rise developments in the sense that they were within the limit of the built-up areas before 1960 while high-rise developments took place in these areas after 1965. In addition, each of these areas contains at least one high-rise apartment built in or after 1971 so that the stress brought about by the high-rise developments is still a recent phenomenon.

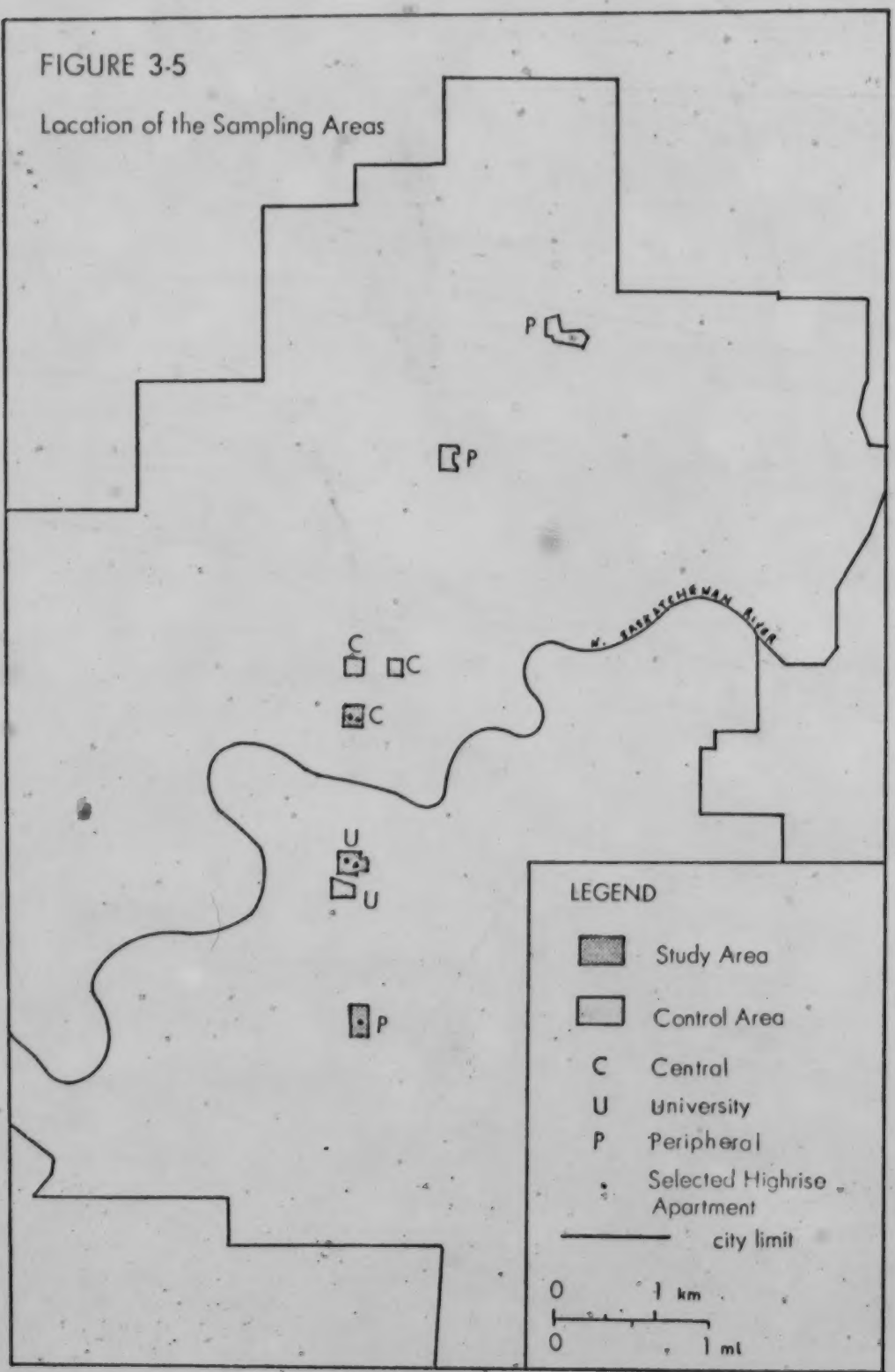
The location of these areas are shown in Figure 3-5. It can be seen that the areal extent of each study area is quite small. It is thought that the impact of high-rise developments can be felt by each household under study because of the small areal extent of the study areas. The boundary of each study area corresponds roughly to those of the enumeration areas so that census information can be used to set up control areas.

Based on the information given by the 1971 census, three corresponding sets of control areas were chosen. Their respective locations are also shown in figure 3-5.

The variables used for the control are: (1) the sex ratio, (2) the age structure, and (3) the marital status of the areas'

FIGURE 3-5

Location of the Sampling Areas



population, (4) the dwelling characteristics, (5) the number of children per family, and (6) the annual family income. Most of these variables are related to the demographic structure of the selected areas; as has been demonstrated by Chapin that age, sex and household structures are some of the major variables determining the daily activity pattern of the individual.[6] A description of the study areas as compared to their corresponding control areas in terms of the above variables is presented in Table 3-3.

Although considerable effort has been spent on finding control areas, it is clear from Table 3-3 that the study areas do not match the control areas in every variable selected.[7] For instance, the 'central control area II' has a much younger population than the 'central study area'; and the households in the university study group have a higher average family income than those in the university control group. Nevertheless, the general socio-demographic profile of the control groups does resemble that of the study groups. Survey data, to be presented in the next chapter (Tables 4-1 to 4-18), give additional support to the validity of the controlling procedure.

2. The Choice of Householders

Householders living in the selected area were sampled systemmatically by tracing the Henderson's City Directory, 1974.[8]

Table 3-3

A Comparison of the "Study" and "Control" Areas*

Control Variables	Central Areas			University Areas		Peripheral Areas		
	S.A.	C.A.II	C.A.I	S.A.	C.A.	S.A.	C.A.II	C.A.I
Population	1176	1071	1095	1413	435	997	585	675
males (%)	46.3	45.5	45.5	41.9	43.5	49.5	49.1	50.0
female (%)	53.7	54.5	54.5	58.2	56.3	50.4	50.9	50.0
Age Groups								
0.24 (%)	36.7	64.1	47.4	55.8	46.5	54.0	57.0	50.5
25-29 (%)	15.7	16.0	17.8	14.2	10.3	11.0	13.7	8.9
30-64 (%)	34.8	21.8	26.4	34.6	29.9	34.1	27.4	36.3
over 65 (%)	12.8	3.6	6.4	13.6	16.5	2.0	0.9	5.2
Marital Status								
single (%)	42.4	49.0	37.2	47.6	41.1	45.2	47.0	43.0
married (%)	50.8	44.9	54.8	39.2	45.5	50.2	48.7	50.4
other	7.0	6.2	8.7	9.7	13.4	4.5	0.9	3.7

Table 3-3 (Continued)

Control Variables	Central Areas S.A.	Central Areas C.A.II	Central Areas C.A.I	University Areas S.A.	University Areas C.A.	Peripheral Areas S.A.	Peripheral Areas C.A.II	Peripheral Areas C.A.I
Dwelling Characteristics								
Total dwelling units	598	424	540	290**	175	317	160	210
owner occupies (%)	7.3	12.1	8.4	47.6	48.6	34.1	46.9	42.9
renter occupied (%)	92.7	87.9	91.7	52.4	51.4	65.2	53.1	57.1
single detached (%)	10.1	11.8	9.3	76.9	62.9	32.2	46.9	28.6
single attached (%)	1.6	0.7	0.0	5.2	0.0	11.7	0.0	11.9
appartments (%)	88.3	87.5	90.7	17.3	37.1	57.4	53.1	59.5
# of children per family	0.656	0.94	0.494	0.767	1.07	1.4	1.8	1.36
Average family income ($)	9267	7908	9470	12075	10045	8650	9610	9386

*The above statistics are calculated from the data given in the 1971 Census. The central study area is composed of enumeration areas 807-16, 17, and part of 18 and 20. The first central control area is made up of enumeration areas 807-214 and part of 219, 215, 216 and 218. The second control area correspondes to 807-154, 156 and 157. The university study area is composed of 809-175, 214 and part of 173, 174, 213, 215 and 219 while that of the university control area is corresponding to enumeration area 809-171. The peripheral study area is made up of 809-109 and part of 105 and 107. The first peripheral control area is equivalent to enumeration area 808-315 and the second corresponds to 810-315. The above figures represent a summation of the data given in the census. See Statistic Canada, 1971 Census of Canada, Population: General Characteristics and Housing, Information Canada, Ottawa, Mar. 1973.

**This excludes the approximately 350 highrise apartment units already present in the area in 1971.

It was found later that the directory is not very reliable. Some of the addresses listed are non-existent or out-dated. On the other hand, some of the existing addresses are not listed. Nevertheless, the directory is the most readily available and detailed source for address listings. As long as there is no systematic error found, a systemmatic sample based on the directory can be assumed to be an unbiased representation of the whole population.

Except in the university areas where there are no walk-up apartments listed in the directory, the number of houses and walk-up householders obtained in the initial sample is approximately equal by using different sampling rates. This was done to get a more comparable set of data from people living in different types of dwellings.

Questionnaires were designed and sent out to the selected householders, to be filled out and mailed back to the researcher. Two pretests done in April, 1975, approximately one month before the full scale survey, were carried out. They showed return rates of 35 to 40 percent. Based on such an expectation and on considerations of the size of subsamples needed for statistical analysis, the following number of householders were selected: (1) central study area, 144; (2) university study area, 93; (3) peripheral study area, 134; (4) central control area, 112;

(5) university control area, 107; (6) peripheral control area, 144.

As has been indicated, the Henderson's City Directory is not a very reliable source. Some of the questionnaires did not reach the respondents because of wrong addresses. The actual number of questionnaires delivered are: (1) central study area, 99; (2) university study area, 92; (3) peripheral study area, 134; (4) central control area, 101; (5) university control area, 99; (6) peripheral control area, 144.

Householders living in high-rise apartments in the study areas were also sampled. First, high-rise apartments were chosen; householders living in the selected apartments were then sampled systemmatically according to the name lists given in the directory of each apartment. A Description of the chosen high-rise is given in Table 3-4. It can be seen that in every study area, there is a recently constructed high-rise apartment included in the sample. In addition, Casa Avenida Apartments of the central area and Varscona Tower of the university district have a longer history. Thus, both the more recently constructed and older high-rise apartments are represented in the sample. In the initial sample, 64 high-rise housholders in the central area, 89 in the university area, and 76 in the peripheral area were selected. The actual number of questionnaires delivered are: 55 in the central area; 89 in the university area; and 65 in the peripheral area, because the name lists used are somewhat out-dated.[9]

Table 3-4

A Description of the Chosen Highrise Apartment

Area		Name	Year of Construction	# Suites	# Storys
Central	1.	Casa Avenida Apartment	1967	90	14
	2.	The Wimledon Apartment	1973	164	17
University	1.	College Plaza 2	1973	309	27
	2.	Varscona Tower	1967	86	13
Peripheral		Southgate Tower	1972	171	22

Source: City of Edmonton, Planning Depatment. "Highrise Apartments in Edmonton." Information Sheet, no. 2, March, 1974.

The questionnaires were sent out in the first week of June, 1975. A follow-up reminder was mailed out on June 15. Despite the effort, the questionnaire return rate was unexpectedly low, especially those found in the central and peripheral control areas where less than 10 percent of the questionnaires were returned. Therefore, a second control area was chosen for these two districts. Instead of mailing out the questionnaires, a door to door personal delivery and pick up was carried out. The number of householders used in the initial sample are 35 and 40 respectively for these two control areas.

Table 3-5 gives the number of questionnaires distributed in each of the areas under study along with the number returned. Out of a total of 953 questionnaires sent out, 240 were returned. Only 221 of these are used for further analysis because there are too many missing observations in some of the returned questionnaires.

The questionnaire return rate varies with the types of subsamples (that is, the high-rise, study and control groups of householders) and their relative locations. It is indicated in Tables 3-5 and 3-6 that the return rates for both the study and high-rise groups are much higher than those for the control groups. However, the difference in the rate of return between the study and high-rise groups is statistically insignificant.[10] Except for the university subsamples in

Table 3-5

Distribution of the Subsample Sizes by the Number of Questionnaires Sent Out and by the Number Returned*

Type of Sampling Areas	Central	University	Peripheral
Highrises	55(13)	89(29)	65(12)
Control I	101(12)	99(35)	144(11)
II	35(13)	--	40(22)
Study	99(31)	92(30	134(34)
Grand Total	953(240)		

*The figures ourside the parentheses are the number of questionnaires sent out to the potential respondents.

The figures within the brackets are the number of questionnaires returned.

Source: Survey Data.

Table 3-6

A Summary of the Chi-Square Tests on the Frequency Distribution of the Returned Questionnaires

Subgroup Pairs	Chi-Square	D.F.	Significance Level
For all Respondents	15.64	2	0.005
Between Control I and Study Group	14.27	1	0.001
Between Control I and Highrise Group	10.29	1	0.001
Between Study and Highrise Group	0.64	1	insignificant

Source: Survey Data

which relatively high return rates are reported for all three types of respondents, the control groups show the lowest return rates (Table 3-7).

The variation in the return rates can be attributed to a number of factors. First, people living in the university area are likely to be related to the institution in one way or another. It would not be surprising to find them to be more cooperative in a questionnaire survey administered by a university student. Thus, a higher return rate from this group can be expected.[11] Secondly, proportionately more professionals are found in high-rise apartments than in other types of housing, as will be shown in the next chapter (Table 4-14). Since people in this socio-economic stratum are likely to be more educated than people further down the hierarchy, one would expect a higher response rate from them. However, as illustrated by census data (Table 3-3), the households in the study and control subsamples are demographically and socio-economically similar to each other. Hence, the difference in the response rates cannot be attributed to these factors, namely, the factors related to the social profile of the subpopulations. It seems that some other forces are likely to be at work. It is likely that people are more interested in the problems of their immediate concern. Thus people living in high-rise neighborhoods would likely to be more interested in the present study than people living elsewhere. If the higher response rates given by the 'study groups' reflect their general concern

Table 3-7

Frequency Distribution of the Questionnaires by the Type of Respondents, Controlled for the Relative Location of the Sampling Areas

Questionnaires	Central			University			Peripheral		
	HR	Study	Control	HR	Study	Control	HR	Study	Control
Returned	13	31	12	29	35	30	12	34	11
Unreturned	42	68	89	60	64	62	53	100	133

Source: Survey Data

Results of Chi-Square Tests.

(1) For Central Area:
$\chi^2 = 22.18$ df = 2 significant at 0.001

(2) For University Area:
$\chi^2 = 0.26$ df = 2 significant at 0.001

(3) For Peripheral Area:
$\chi^2 = 13.20$ df = 2 significant at 0.001

with the research, subsamples thus drawn will still be unbiased representations of the respective subpopulations. However, not all residents in the high-rise neighborhoods would have the same degree of concern for their residential environment. This implies that the sample may over-represent those households whose heads care much about high-rise developments in their neighborhood. Nevertheless, the degree of distortion is unknown and no attempt can be made to correct the bias.

III. The Design of the Questionnaire

Since the present study deals with the household's activity system, data have to be collected on the household level. This implies field survey is neccessary. The study covers widely scattered areas over the city, and requires a rather large number of households to be sampled. In order to give a more meaningful analysis, the questionnaire, rather than the interview schedule, was chosen to be the instrument of the survey. Due to the low rates of return, a second control area was chosen for both the central and peripheral districts. A door-to-door personal delivery and pick up of questionnaires was carried out in these two areas. The respondents still had to complete the questionnaires by themselves, however.

Three different sets of questionnaires were design for the three

different types of respondents: the high-rise dwellers, the householders living in the proximity of high-rise apartments, and those living in the control areas (see Appendix). Since they were set up to collect comparable information, these sets of questionnaires share many common features.

First, all the questionnaires are addressed to the heads of the households in order to standardize the source of the information collected. Second, the first six questions in each of the questionnaires are concerned with the general characteristics of the respondent and his family. In the middle part of each questionnaire, a series of questions on the time allocation pattern of the respondent's daily activities are asked. The choice of activities listed has been discussed in the last chapter. Since the high-rise dwellers do not have any yard to tend, the activities listed in the questionnaires sent out to them are somewhat different from the other two sets. In all three sets of questionnaires, the subject is asked to indicate the time, in hours and minutes, he spends on each of the listed activities on an average weekday and on an average Sunday. This measure tends to be crude in nature because it is not easy for the subject to give an accurate and precise estimate of the time which he spends on a certain activity on the average. The present approach has its advantages, however. First, it avoids the difficulties

in designing the research instrument when other methods, for example, a diary approach, are used to collect minute details of the subject's daily time use pattern. In addition, by using this method, the number of observations can be reduced to a large extent and information on those less frequently performed activities can still be obtained. Further, the inaccuracy of the measurement can be assumed to be randomly distributed if no systemmatic error is found such that the average of the time spent by a group of respondents on a certain activity would be a rather accurate measure.

Finally, in the last part of the questionnaires, questions are asked on the respondent's socio-economic status and the activity pattern of his children. The latter set of questions was included because it was thought that high-rise apartment developments would have an effect on children's daily activities, especially out-door recreation.

Differences also exist among the three sets of questionnaires, especially between the set sent to the study group of respondents and the other two sets. The former is considerably longer. Additional questionnaires are asked to obtain a more detailed picture of the household's mobility tendencies; its adjustments to the environmental stimulus and the head of household's opinion towards high-rise developments in his neighborhood. In order to

have a more objective description of the householder's attitude towards high-rise developments, a 15 variables X 7 points semantic differential scale was constructed. The choice of the differentials is based on considerations of both the research context and the adjective pairs used in other studies related to neighborhood environment; in particular, those of Johnston[12] and Diaso and his colleagues[13] The bipolar variables used in the research are: (1) safe neighborhood; (2) friendly neighborhood; (3) desirable neighborhood; (4) private neighborhood; (5) hazardous traffic; (6) congested traffic; (7) adequate services; (8) convenient services; (9) adequate facilities; (10) convenient facilities; (11) beautiful landscape; (12) variety of landscape; (13) open space; (14) green landscape; (15) satisfied (with the overall environmental changes brought about by high-rise constructions).

The first four variables are related to the neighborhood's social environment under high-rise developments. The next two are concerned with the traffic condition. The seventh to tenth variables measure the accessibility characteristics. The eleventh to fourteenth describe the householder's attitude towards the landscape quality of the neighborhood. Finally, the last variable is included to measure the householder's overall satisfaction with his new neighborhood environment. It can be treated as a summarized

measure of the respondent's feeling as described by his ratings on the first fourteen variables.

Data collected by the questionnaire survey will form the basis of the empirical tests of the hypotheses formulated. Sources of error are numerous during the data collection process. An evaluation of the controlling procedure and the general validity of the data will be attempted in the next chapter.

IV. A Note on the Techniques Used in the Analysis

Statistical methods are used to test the hypotheses formulated in the last chapter. Most of the methods used are standard techniques, such as the difference of means test, factor analyses of semantic differentials, regression analysis and calculation of correlation coefficients. However, some of the statistical methods employed in this study are not as widely used because of the nature of the data. They are : (1) Mann-Whitney's two sample rank test; and (2) pair-t test. Each of these tests will be discussed separately.

1. Mann-Whitney's Rank Test.

In order to find out whether there are differences in the ratings on the semantic differentials by the different groups of respondents, Mann Whitney's two sample rank test is used in the analysis. This test is a non-parametric equivalent of the difference

of means test and has been described by Blalock as a difference of summed-rank test.[14] Although Osgood and his colleagues[15] argue that the semantic differentials are essentially interval scales, it is much safer to assume only ordinal scale properties for the ratings on the semantic differentials used in the present study. Therefore, a non-parametric test is used in favor of a difference of means test.

The Mann-Whitney test has advantages over other non-parametric tests. First of all, it is a direct analogue of the difference of means test. Moreover, it possesses a power efficiency very close to the latter even when the sample size is small. Blalock, because of all these reasons, argues that this test should be used in instances where there is reasonable doubt of the legitimacy of either the interval scale or normality.[16] Hence, the test is used in the present study.

2. Pair-t Test.

This test is usually employed in experimental or ex post facto studies, in which an experimental group of subjects is studied and compared to a control group chosen by the method of matching. Usually, the two groups are matched person by person or by pairs of subgroups having very similar characteristics. Observations from each matching pair on some specific characteristics, or dependent

variables, are compared after an experimental or independent variable is introduced to the experimental group. The differences for pairs of observations with respect to each dependent variable are summed and a t test is applied to determine whether the sum of differences is significantly different from zero. If this is the case, then, it can be inferred that the experimental variable is responsible for the changes or differences observed in the specific dependent variable under study.

The pair-t test is used in the present study in a somewhat different manner. Instead of comparing observations from pairs of subgroups on a certain dependent variable, the study group of respondents is compared to the control group with respect to their time spent on a number of activities chosen for this study. These activities are assumed to represent a sample of an infinite number of activity categories. The mean time allocated to each of the selected activities by the study and control groups is treated as a pair of matching observations. Their difference is calculated and standardized by means of the z statistic. The z scores of difference for all activities under consideration are summed. A t test is applied to determine whether the sum of z's is significantly different from zero. A significant difference would imply that the experimental variable, high-rise developments in the subject's neighborhood, has an effect on his time allocation

pattern. If the t is found to be insignificant, then the hypothesis that high-rise developments affect the time allocation pattern of the neighboring householders has to be rejected.

Besides these two test, other statistical techniques are also employed in the study for the investigation of the relationship between high-rise apartment developments and the householder's activity pattern. These methods will not be dealt with here, however. It is because most of them are more or less standardized techniques. Moreover, it is felt that for the other less commonly used methods, for example, the calculation of correlation coefficients on the rank order of mean time allocated to the selected activities, more appropriate discussions can be given along with the results of the findings.

Footnotes

1. Other cities in the country had experienced vigorous apartment construction activities in the same period. See L.S. Bourne and J.D. Berridge, "Apartment Location and Developer Behavior. A Reappraisal." The Canadian Geographer. Vol. 18, 1972. pp.403-11. Also, G. Nadar, "Some Aspects of the Recent Growth and Distribution of Apartments in the Prairie Metropolitan Areas." The Canadian Geographer. Vol. 15, 1971. pp. 307-17.

2. Lawrence D. McCann. Changing Morphology of Residential Areas in Transition. Unpublished Ph.D. Thesis. University of Alberta, Edmonton, 1972.

3. Statistics Canada. 1971 Census of Canada. Population: General Characteristics and Housing. Ottawa, Mar., 1973.

4. City of Edmonton, Planning Department. Information Sheet, no.2. March, 1974.

5. Some other authors refer studies of this sort as ex post facto studies. See, for example, Claire Seltiz, Marie Jahoda, Mouton Deutsch and Stuart W. Cook. Research Methods in Social Relations. New York, McGraw Hill, 1959.

6. F. Stuart Chapin. Human Activity Patterns in the City. New York: John Wiley and Sons, 1974; and F. Stuart Chapin and R.K. Brail, "Human Activity Systems in Metropolitan United States." Environment and Behavior. Vol. 1, 1969. pp.107-30.

8. Henderson Directories. Henderson's Edmonton City Directory, 1974. Vancouver: Henderson Directories, 1974.

9. The above figures are determined by the number of householders used in the initial sample minus the number of undelivered questionnaires that were returned to the sender.

10. Control groups set II are excluded in Table 3-6 and 3-7, because they were administered by personal delivery and pickup and because they were deliberately added when the response rates in the first of control areas was found to be too low.

11. The overall return rates by the relative location of the subsamples are: central, 22.6% (56); university, 33.4% (94) and peripheral, 16.4% (57). A X^2 of 37.8 with 2 degrees of freedom is calculated which is significant at 0.001 level.

12. R. J. Johnston, "Spatial Patterns in Suburb Evaluation." Environment and Planning. Vol. 25, 1975. pp. 385-95.

13. Robert J. Diaiso, D.M, Friedman, L.C. Mitchell and E.R. Schweitzer. Perception of the Housing Environment: A Comparison of Racial and Density Preference. Graduate School of Public and International Affairs and Graduate School of Public Health, University of Pittsburgh, Pittsburgh, 1970.

14. Herbert M. Blalock, Jr. Social Statistics. New York: McGraw Hill, 1961, p.200.

15. Charles E. Osgood, "Semantic Differential Techniques in the Comparative Study of Cultures." American Anthropologists. Vol. 66, 1964. pp. 121-200. Also, Norman Cliff, "Adverbs as Multipliers." Psychological Review. Vol. 66, 1959. pp. 27-44.

16. Blalock, op. cit., p.203.

CHAPTER FOUR

HIGH-RISE RESIDENTS AS COMPARED TO PEOPLE LIVING IN OTHER KINDS OF DWELLINGS

I. Introduction

It was argued earlier that most people do not like construction of high-rise apartments in their neighborhood. Data from the questionnaire survey indicate that people are most concerned with the changes in the social and physical environment associated with high-rise developments. Specifically, the neighboring householders think that high-rise developments would bring about a type of land use and a kind of people that are incompatible with the neighborhood. It is useful to examine whether people living in high-rises are really different from those living in other housing structures. There are few studies which compare the social profiles of people living in different types of housing; however.[1] Therefore, the discussion that follows will be based primarily on the findings of the present study.

The data will be disaggregated to give a comparison of the study and control groups of respondents. This allows an evaluation of the controlling procedure.

II. Demographic Characteristics.

The discussion in the second chapter suggested that

the transient characteristics of the high-rise residents is one of the major concerns to the neighboring households. Thus, some of the indices on residential transience are first examined.

Table 4-4 gives the percentage distribution of the number of moves experienced in the past five years by the respondents. It shows that high-rise dwellers indeed have a higher mobility rate than the house dwellers living in comparable areas. However, the relatively high mobility rate is shared by the walk-up apartment dwellers.

The pattern described can also be revealed from the time that respondents have stayed at their present addresses. Table 4-2 indicates that there is a much higher percentage of residents who had stayed for less than two years in their present address in the high-rises than in houses (57.2% for high-rise residents versus 30.9% and 23.3% for house dwellers living in the study and control subsamples respectively). An even greater percentage of walk-up residents have length of residence less than two years (76.1% and 71.4% respectively for the study and control subsamples). In Table 4-3, the mean years of residence at their present address for the inhabitants living in the central, university, and peripheral areas are given. Again, the same pattern emerges. It is clear that house dwellers stay for a much longer time in their present dwellings than apartment residents, whether they live in high-rises or walk-ups. In addition, this pattern is invariant with the relative location (from the city center) of the sampling areas.

Table 4-1

Percentage Distribution of the Number of Moves Experienced by the Respondents in the Last Five Years*

# Moves	High-rise	House S.G.	C.G.	Walk-up S.G.	C.S.
0	18.4(9)	43.5(30)	50.9(28)	25.0(4)	3.6(1)
1	20.4(10)	11.6(8)	23.6(13)	12.5(2)	28.6(8)
2	22 4(11)	15.9(11)	10.9(6)	18.8(3)	17.9(5)
3	18.4(9)	15.9(11)	1.8(1)	12.5(2)	17.9(5)
4	8.2(4)	4.3(3)	3.6(2)	18.8(4)	10.7(3)
5	6.1(3)	1.4(1)	7.3(5)	12.5(5)	10.7(3)
6 or over	6.0(3)	7.1(5)	1.8(1)	0.0(0)	10.8(3)
mean	2.367	1.739	1.255	2.250	3.286
n	49	69	55	16	28

* Source: Survey Data

The figures within the brackets give the absolute frequency.

S.G. = Study Group C.G. = Control Group

Table 4-2

Percentage Distribution of the Years of Residence at the Present Address among the Respondents in the Three Types of Housing*

Years	High-rise	House S.G.	C.G.	Walk-up S.G.	C.G.
0-1	57.2(28)	30.9(21)	23.2(13)	76.1(13)	71.4(20)
2-3	28.6(14)	16.2(11)	19.7(11)	11.9(2)	25.0(7)
4-5	0.0(0)	5.9(4)	9.0(5)	0.0(0)	2.6(1)
6-10	14.3(7)	13.2(11)	7.1(5)	6.0(1)	0.0(0)
11 or more	0.0(0)	31.1(21)	39.3(22)	6.0(1)	0.0(0)
mean	2.184	10.735	10.143	1.81	1.286
n	49	68	56	17	28

*Source: Survey Data

The figures within the brackets give the absolute frequency.
S.G. = Study Group C.G. = Control Group

Table 4-3

Mean Years of Residence of the Respondents by the Relative Location of the Sampling Areas*

Location	High-rise	House S.G.	C.G.	Walk-up S.G.	C.G.
Central	1.23(13)	11.83(18)	10.78(9)	2.50(8)	1.14(14)
University	3.08(26)	11.82(28)	10.73(30)	----	----
Peripheral	1.10(10)	8.46(22)	8.76(17)	1.19(9)	1.43(14)

*Source: Survey Data

The figures inside the parentheses give the sizes of the subsamples.
There is no walk-up apartment in the university sampling area.

S.G. = Study Group C.G. = Control Group

Table 4-4

A Comparison of the Empirical Findings of the Mobility of Highrise Residents

No. of Moves	This Study[a]	Hayter's[b]	Graham et al.'s[c]
0	18.4%	0.0%	2.6%
1	20.4	13.0	12.0
2-3	40.8	42.8	41.2
4-5	14.3	21.4	19.7
6 or more	6.0	31.4	23.6

Sources:

[a] Survey Data

[b] Jacqueline G. Hayter. Residential Mobility and the Function of Seven Highrises in Central Edmonton. Unpublished M.A. Thesis. Edmonton, University of Alberta, 1973, p. 140

[c] A. Graham et al. Families in Highrise Apartments: A First Study. Toronto: Social Planning Council of Metropolitan Toronto, 1973, p. 59.

Note that the mobility rates reported by the high-rise residents in the present study are somewhat lower than those reported in previous findings. In both Hayter's study of seven high-rise apartments in central Edmonton and Graham and his colleaques' study at Metropolitan Toronto,[2] the percentage of high-rise households who had experienced more than four moves is much higher than that suggested by Table 4-1. It can be seen that few high-rise residents in the samples of the earlier studies had experienced less than one move (13.4% and 14.6% in Hayter's and Graham and his colleaques' study, respectively, versus 38.8% in the present study). The difference in the result is probably due to the different sampling designs and the different definitions given to the variable 'number of moves'. While the high-rise apartments selected for the present study are intended to represent high-rises found at different distance zones from the city center, those sampled by Hayter are found solely in the central part of the city; whereas, those high-rises used in Graham and his associates' research are selected from a list of low- and middle-rent apartments in Metropolitan Toronto. Furthermore, only moves experienced in the last five years are reported in this study while all moves since marriage were listed in Graham and his associates' report. In Hayter's study, no clear definition of the variable is given.[3] (Table4-4)

A comparison of the results in this study and Hayter's work on the variable 'duration of stay', a variable having identical interpretations in both studies, supports this claim. As shown in Table 4-5, the two studies give approximately the same results although somewhat shorter stay is reported in Hayter's study.

Table 4-5

A Comparison of the Duration of Stay between Findings from Hayter's Study and This Study

Years of Stay	Hayter's Study[a]	This Study[b]
0-1	64%	57%
2-3	25	29
4-5	6	0
6 or more	6	4

Sources:

[a] J. G. Hayter, op. cit., p. 121, figure 5-1.

[b] Survey Data

The variables 'number of moves' and 'duration of stay' measure the mobility rate that has been experienced by the respondents in the past. In order to have a more complete picture about the residential transience of the different kinds of dwellers, questions on their move intentions were asked. The data collected indicate that apartment dwellers, particularly the high-rise residents, have a greater tendency to move than the house dwellers. This relationship is invariant even when the location of the sampling areas is controlled (Table 4-6).

All three indices of residential mobility, 'number of moves', 'duration of stay', and 'move intention' describe the same pattern: that the apartment dwellers, regardless of whether they live in high-rises or walk-ups, have experienced a higher rate of residential mobility in the past and have a greater intention to move in the future than the inhabitants in houses.

The relative high rate of mobility characterizing the high-rise inhabitants as well as the walk-up apartment dwellers is related to other aspects of their demographic structure. First the survey data show that there are more single or divorced persons living in apartments than in houses (Table 4-7). This relationship holds when the relative location of the sampling areas is controlled (Table 4-8).

Table 4-6

Percentage Distribution of the Respondents who Intended to Move in the Foreseeable Future

Location	High-rise	House S.G.	C.G.	Walk-up S.G.	C.G.
Central	53.8%(13)	50.0%(18)	50.0%(8)	37.5%(8)	35.7%(14)
University	46.2 (25)	28.6 (27)	76.7 (26)	----	----
Peripheral	70.0 (10)	31.8 (22)	17.6 (17)	44.4 (9)	42.9 (14)

The figures within the brackets indicate the size of each subsample.

Source: Survey Data

Table 4-7

Percentage Distribution of the Respondents' Marital Status by the Type of Housing

Marital Status	High-rise	House S.G.	C.G.	Walk-up C.G.	C.G.
Married	40.0(20)	65.2(43)	63.6(35)	22.2(4)	39.3(11)
Single	36.0(18)	16.7(11)	16.4(9)	44.4(8)	32.1(9)
Divorced	4.0(2)	6.1(4)	5.6(3)	27.8(5)	14.3(4)
Widowed	20.0(10)	12.1(8)	12.8(7)	5.6(1)	7.1(2)
Unclassified	--	--	1.8(1)	--	7.1(2)
	50	66	55	18	28

The figures within the brackets are the absolute frequency.

Table 4-8

Percentage Distribution of the Respondent Householders Who are Single, by the Type of Housing and by the Relative Location of the Sampling Areas*

Location	High-rise	House S.G.	C.G.	Walk-up S.G.	C.G.
Central	38.5% (13)	16.7% (18)	11.1% (9)	37.5% (8)	35.7% (14)
University	37.0 (27)	27.6 (29)	23.3 (29)	----	----
Peripheral	30.0 (10)	4.5 (22)	5.9 (17)	30.0 (10)	28.6 (14)

*Source: Survey Data

The figures within the brackets are the absolute frequency.

Table 4-9

Percentage Distribution of the Respondent Households by the Size of the Family

Family Size	High-rise	House		Walk-up	
		S.G.	C.G.	S.G.	C.G.
1	51.0%(25)	13.6%(9)	16.7%(9)	22.2%(4)	46.4%(13)
2	38.8 (19)	36.4 (24)	40.7 (22)	44.4 (8)	32.8 (9)
3	4.1 (2)	19.7 (13)	22.2 (12)	27.8 (5)	3.6 (1)
4	6.0 (29)	18.2 (12)	11.1 (6)	5.6 (1)	14.3 (6)
5 or more	0.0 (0)	12.1 (8)	9.3 (5)	0.0 (0)	3.6 (1)
mean	1.653	2.909	2.574	2.167	1.964
n	49	66	54	18	28

*Source: Survey Data

The figures in the brackets are the absolute frequency.

Table 4-10

Mean Size of Family by House Types

and Relative Location

Location	High-rise	House		Walk-up	
		S.G.	C.G.	S.G.	S.G.
Central	1.462(13)	2.882(17)	2.333(9)	2.25(8)	1.429(14)
University	1.423(26)	2.750(28)	2.179(28)	----	----
Peripheral	2.500(10)	3.143(21)	3.353(17)	2.10(10)	2.50 (14)

Source: Survey Data

The figures within the parentheses give the size of each subsample.

Second, apartment dwellers, in general, have smaller families than people living in houses. In fact, a very large percentage of apartment 'families' consist of only one person, as shown in Table 4-9. The family size in houses is generally larger, with 50 percent of the house respondents in the study and 42.6 percent in the control groups have family size of three or more. Again, the relationship is invariant with the relative location of the sampling areas (Table 4-10). Past studies show that the rate of residential mobility is inversely related to the size of the family.[4] Since high-rise households have smaller family sizes, their mobility rate can be expected to be higher than that of the house dwellers.

Finally, the survey data indicate that proportionately more heads of households living in the apartments are in the age group 25 or younger. On the other hand, the majority of householders in houses are between 31 and 65 years of age, a stage of the family cycle associated with low rate of residential mobility[5] (Table 4-11). The above observation holds when the relative location of the sampling areas is controlled (Table 4-12).

Therefore, all measures of demographic characteristics employed in this study describe very much the same pattern. A greater proportion of apartment dwellers are mobile, unattached and under 25 years of age than people living in houses. However, the survey data show no fundamental differences between the walk-up and high-rise apartment households. Demographically, they belong to the same

Table 4-11

Percentage Distribution of the Respondents by the Age of the Household Head*

Age	High-rise	House		Walk-up	
		S.G.	C.G.	S.G.	C.G.
25 or under	30.2(13)	15.0(9)	13.6(7)	58.8(10)	57.8(15)
26-30	25.6(11)	16.7(10)	11.5(6)	11.8(2)	11.5(3)
31-65	30.2(13)	53.3(32)	67.5(35)	23.6(4)	23.1(6)
66 or over	14.0(6)	20.0(12)	11.5(6)	5.9(1)	7.7(2)
n	43	60	52	17	26

*Source: Survey Data

The figures in the brackets are the absolute frequency.

Table 4-12

Percentage Distribution of the Respondent Households Whose Heads are 25 or Under by Age in the Different Sampling Locations

Location	High-rise	House		Walk-up	
		S.G.	C.G.	S.G.	C.G.
Central	40.0%(10)	26.7%(15)	12.5%(8)	62.5%(8)	69.2%(13)
University	26.1 (23)	19.2 (26)	18.5 (27)	----	----
Peropheral	50.0 (10)	0.0 (19)	5.9 (17)	55.6 (9)	46.2 (13)

Source: Survey Data

group. Statistical tests of difference on the chosen demographic measures confirm the above conclusion. It can be seen in Table 4-13 that the differences between high-rise and walk-up dwellers with respect to the chosen variables are generally small and statistically insignificant. On the other hand, the difference between high-rise and house dwellers as well as between walk-up and house residents are large and statistically significant for all the variables selected.

III. Socio-economic Status

In terms of socio-economic status, the high-rise apartment dwellers are quite different from the walk-up residents. Proportionately, more high-rise householders and their spouses are in the professional managerial group than those living in other types of housing (Table 4-14). In addition, the high-rise households enjoy the highest average family income among the three groups (Table 4-16). Nevertheless, when the relative location of the sampling areas is controlled, much of the difference between the high-rise and house respondents disappears. Except in the control areas where a much larger proportion of high-rise householders and their spouses are in the professional-managerial group and where their average family income is much higher than the house dwellers, the difference between the two groups of respondents is small (Tables 4-15 and 4-17). The above findings suggest that difference in socio-economic status between high-rise and house dwellers is unlikely to pose a threat to the latter. When the relative location of the sampling

Table 4-13

A Summary of the Statistical Tests of Difference in the Chosen Demographic Variables

Variable	Between High-rise-House	Between High-rise-Walk-up	Between House-Walk-up
No. of moves (t)	2.32*	0.823	2.97**
Years of stay (t)	7.112**	1.662	7.937**
Move intention (t)	2.613**	1.369	0.942
Age of Head (t)	2.20*	1.604	4.513**
Family Size (t)	6.31**	2.139*	3.435**
Marital Status of Head (χ^2)	10.43** (df=2)	0.283 (df=2)	8.520** (df=2)

* Significant at p = 0.05
**Significant at p = 0.01

[a]For the walk-up apartment dwellers and house residents, the means and standard deviations used in the calculated represented the average of those goven by the "Study" and "Control" groups of respondents.

Table 4-14

Occupation of the Respondent Household and/or His Spouse by House Type*[a]

Occupation	High-rise	House S.G.	House C.G.	Walk-up S.G.	Walk-up C.G.
Professional-managerial	60.4% (29)	42.1% (4)	45.1% (23)	26.3% (5)	16.7% (4)
Clerical	12.5 (6)	12.5 (8)	13.7 (7)	36.8 (7)	37.5 (9)
Student	4.2 (2)	3.1 (2)	3.9 (2)	5.2 (1)	8.3 (2)
Unemployed	18.8 (9)	31.3 (20)	23.5 (12)	10.5 (2)	12.5 (3)
Other (Mainly blue-collar)	42.2 (2)	10.9 (7)	13.7 (7)	21.1 (4)	25.0 (6)
n	48	64	51	19	24

*Source: Survey Data

[a]The professional-managerial class includes all households having either the head or the spouse holding a professional or managerial position. The clerical class includes all households with either the head or spouse being clerical worker but neither of them is in the professional-managerial category. The "other" occupation category includes households having neither the head not the spouse working as professional-managerial or clerical but at least one of them is employed. For the 'student' category, either spouse is a student but none of them is employed. To the 'unemployed' group, both the head or the spouse is unemployed.

Table 4-15

Percentage Distribution of the Respondent Households in the Professional-Managerial Group by Relative Location of the Sampling Areas[b]

Location	High-rise	House		Walk-up	
		S.G.	C.G.	S.G.	C.G.
Central	58.3%(12)	16.7%(18)	25.0%(12)	22.2%(9)	0.0%(11)
University	69.2 (26)	50.0 (26)	48.0 (25)	----	---
Peripheral	40.0 (10)	57.9 (19)	57.1 (14)	30.0%(10)	30.8 (13)

The figures inside the brackets give the size of each subsample.

[b]Source: Survey Data

Table 4-16

Percentage Distribution of the Respondents by Annual Family Income

Income	High-rise	House		Walk-up	
		S.G.	C.G.	S.G.	C.G.
$ 0-4999	6.8% (3)	20.0% (11)	18.2% (8)	15.4% (2)	20.8% (5)
5000-6999	6.8 (3)	10.9 (6)	6.8 (3)	15.4 (2)	16.7 (4)
7000-9999	6.8 (3)	9.1 (5)	15.9 (7)	15.4 (2)	25.0 (6)
10000-12999	20.5 (9)	12.7 (7)	22.7 (10)	15.4 (2)	25.0 (6)
13000-15999	20.5 (9)	12.7 (7)	15.9 (7)	15.4 (2)	12.5 (3)
16000-19999	15.9 (7)	18.2 (10)	6.8 (3)	7.7 (2)	0.0 (0)
20000 and over	22.7 (10)	16.4 (9)	13.6 (6)	15.4 (2)	0.0 (0)
Mean	$ 14375	12209	11454	11462	8437
n	44	55	44	13	24

Source: Survey Data

Table 4-17

Mean Annual Family Income by Location of Study Areas

Location	High-rise	House		Walk-up	
		S.G.	C.G.	S.G.	C.G.
Central	$ 15273(11)	$ 8067(15)	$ 7429(7)	$ 10917(6)	$ 8500(12)
University	13739(23)	13478(23)	10956(23)	----	----
Peripheral	14850(10)	14147(13)	14285(14)	11928(7)	8375(12)

The figures within the brackets give the size of each subsample.

is not controlled, the differences between the high-rise and house dwellers with respect to their income and occupation are statistically significant. (Table 4-18) However, the differences only imply an influx of people with higher socio-economic status into the neighborhood when a high-rise apartment is constructed. Whether such a change in the social composition of the neighborhood is an environmental stress to the previous inhabitants is questionable. Traditional studies tend to focus on the invasion of lower class people into upper class neighborhoods. An understanding of the reverse process is lacking.

IV. Conclusion

Findings on the socio-demographic profile of the three groups of respondents: the high-rise, walk-up and house dwellers, have been discussed in the present chapter. The survey data confirm that high-rise apartment dwellers have a high mobility rate. However, the transient characteristics of high-rise residents is not unique. It is shared by walk-up apartment dwellers. It is probably because of the high concentration of people with transient characteristic that result in particular criticisms against high-rise apartments. As far as socio-economic status is concerned, the survey data suggest that high-rise resients would likely be considered as a threat to their neighbors.

Table 4-18

A Summary of the Statistical Tests of Difference on the Measures of Socio-Economic Status of the Sampled Households

	Between HR-House	Between HR-Walk-up	Between House-Walk-up
Family Income (t)	2.337*	3.368*	1.604
Occupation of Head and/or spouse (χ^2)	8.172* (df=3)	28.70** (df=3)	18.20** (df=3)

* Significant at 0.05

**Significant at 0.01

Source: Survey Data

A re-examination of the findings reveals that the social profiles of the study and control groups of respondents are remarkably similar to each other. Statistical tests on the selected indices confirm this observation. (Table 4-19) The specific variables used in the tests are: (1) mean age of the head; (2) mean family size; (3) marital status of householders; (4) mean years of residence (5) mean number of moves; and (6) mean family income.[6] Only the variable 'mean years of residence' shows significant difference between the walk-up apartment dwellers living in the study and control areas (at p= 0.05). The findings thus demonstrate the validity of the control groups in the sample. Further, the findings suggest that they are in general agreement with the census information which was employed in setting up the control areas. It seems that the findings describe the population paremeters rather closely. Hopefully, the rest of the survey would have the same degree of reliability.

Table 4-19

Result of the Tests of Difference between the Study and Control Groups of Respondents

Variable	Statistic	House	Walk-up
Mean age	t	0.823	0.387
Mean family size	t	1.336	0.668
Marital status	x^2 (df=2)	0.174	2.945
Mean years of residence	t	0.267	2.462*
Mean number of moves	t	1.166	1.384
Mean family income	t	1.543	0.584

*Significant at p = 0.05

Footnotes

1. Most of the existing literature is concerned either with those high-rise apartments built as a part of an urban renewal project; or with the characteristics of high-rise residents per se. See A. Stevenson, E. Martin and J. O'Neil, High Living: A Study of Family Life in Flats. Melbourne: Melbourne University Press, 1967; W. Moare Jr., The Vertical Ghetto: Everyday Life in An Urban Project. New York: Random House, 1969; A. Graham, L. Hargarty, W.A. Head, H. Sears, N. Sanathirajah and H. Seyward, Families in Hi-Rise Apartments : A First Study. Toronto: Social Planning Council of Metropolitan Toronto, 1967; and J.G. Hayter, Residential Mobility and the Function of Seven High-rises in Central Edmonton. Unpublished M.A. thesis. Edmonton: University of Alberta, 1973.

There is a recent study by Michelson that presents a systemmatic comparison of apartment and house dwellers. This study is restricted to middle class households, however. See, W. Michelson, Environmental Choice: A Draft Report on the Social Basis of Family Decisions on Housing Type and Location in Greater Toronto. Ottawa: Ministry of State for Urban Affairs, 1972.

2. Hayter, ibid.; Graham et. al., ibid.

3. Ibid.

4. E. G. Moore, Residential Mobility in the City. Association of American Geographers, Commission on College Geography, Resource Paper no. 13, 1973. Washington, D.C.

5. Ibid., pp.10-12.

6. Data from the three sampling areas were aggregated before the tests were performed. This was done because of the smallness of the subsample sizes under further stratification.

CHAPTER FIVE

NEIGHBORING HOUSEHOLDS' ADJUSTMENTS TO THE ENVIRONMENTAL STRESS

Based on the empirical data collected by the survey, attempts will be made in this chapter to: (1) investigate the nature of the stress brought about by high-rise developments on the neighboring households; (2) test the hypotheses on the householder's time allocation pattern under such a stress; and (3) examine other aspects of the household's activity system as related to high-rise developments. Hopefully, the findings can provide some insights into the understanding of a household's activity system under environmental stress.

I. The Structure of the Stress: An Analysis of the Semantic Differential Ratings with regard to the Neighboring Householders' Attitude towards High-rise Developments

In chapter two, a content analysis of the open-ended questions answered by the respondents suggested the stress brought about by high-rise developments in the subject's neighborhood consists of three basic components:

(1) the change in the neighborhood's social environment;

(2) the change in the neighborhood's physical environment;

(3) the change in the accessibilty characteristics of the neighborhood.

The validity of these components as determining factors of the stress can be tested by the subjects' ratings on the semantic differential scales given in the questionnaire with regard to high-rise developments in their neighborhood.

A. Semantic Differential Scale

The technique of semantic differential scale was first introduced by Osgood and his colleagues to study the measurement of meaning.[1] The authors postulate the existence of a semantic space, the universe of all concepts. They believe that some limited number of dimensions can exhaust the dimensionality of the entire space; that is, each concept can be described in terms of some basic dimensions common to all concepts.[2] To uncover these dimensions, a sample of individuals is asked to evaluate a series of concepts in terms of a set of opposite adjective pairs on a bi-polar rating scale. The inter-correlation of the subjects' evaluations across all concepts on each of the adjective pairs is subjected to a factor analysis. The factor extracted would then give the minimum number of dimensions that are capable to describe all the concepts presented in the experiment. It is found that similar factors emerge in experiments conducted in different contexts and involving different sets of concepts. Osgood and Suci argue that such factors constitute the basic dimensions of the entire semantic space and denote them by the names, 'evaluation', 'potency' and 'activity' factors.[3] Cross

cultural analysis suggests that the basic dimensions are invariant with the subjects' cultural background.[4]

The success of Osgood and his colleagues' experiments has led to a wide range of application of the technique, most notably in linguistic and social psychology. It was first introduced in the field of environmental studies in the late 1960's and has since been employed by numerous writers on environemntal evaluation. Golant and Burton,[5] for example, have made use of the technique in studying the individual's concept of hazards. Downs[6] applied the method to determine the consumers' preference of competing shopping centers. Johnston[7] and Diaso and others[8] demonstrated its usefulness in revealing the individual's preference of neighborhood environment.

In all studies, the researchers are not interested in the entire semantic space. Rather, only those segments of the space or those sets of concepts that are relevant to the individual's environment are under investigation. In Johnston's study, for example, the concepts presented are the names of suburban communities while in Diaso and his colleagues, they are photos representing the different types of neighborhood environment. Factor analyses of the subjects' evaluation of the different types with respect to a set of bi-polar adjective pairs give the basic dimensions of the individual's preference system with regard to neighborhood environment. The neighborhoods used in the experiment can then be reclassified according to their positions in the semantic subspace in terms of the basic dimensions or factors extracted.

A somewhat different approach is adopted in the present research. Instead of analyzing the semantic differential ratings of a set of concepts simultaneously, only one concept is to be investigated; namely, the changes of neighborhood environment under high-rise apartment developments. A total of 14 semantic differentials, each consists of a pair of bi-polar adjectives or phrases describing the individual's neighborhood residential environment, are chosen to represent the semantic subspace with regard to the concept concerned. It has been noted that the choice of the differentials is based on considerations of both the research context and the adjective pairs used in other studies related to neighborhood environment. The chosen variables were listed in chapter three. They are not exhaustive. Nevertheless, it is felt that most aspects of the individual's evaluation regarding the neighborhood environmental changes are covered.

In addition to these fourteen variables, each subject was also asked to indicate his level of satisfaction on a 'satified - unsatisfied' continuum. This serves as a surrogate measure of his overall preference toward the changes in the neighborhood environment brought about by high-rise developments.

B. The Semantic Differential Ratings

Before presenting the result of the factor analysis on the fourteen semantic differentials, the general pattern of the ratings will be examined. Since only residents living in neighborhoods with

high-rise developments were asked to give ratings on these scales. the pattern revealed describes the attitude of these groups of respondents only.

A seven point rating system is adopted in the present study on the ground that it is most widely used and has been argued by Osgood and his colleagues to yield approximately equal intervals between rating points.[9] If a metric property can be assumed, the general pattern of the ratings can be discerned quite clearly in Figure 5-1, which gives a description of the mean scores of ratings for all 15 variables, including 'satisfied'. It suggests, using the terminology of Osgood,[10] that the respondents residing in high-rise neighborhoods, on average, think that their neighborhood is 'quite' less safe, less friendly, less desirable and less private than before the high-rise development. Moreover, the traffic is 'extremely' more hazardous and congested and there is 'extremely' less open space and greenery. The landscape of the neighborhood is 'quite' less beautiful and there are 'quite' less varieties. On the other hand, the services provided in the neighborhood are 'slightly' more adequate and convenient although the facilities provided are 'slightly' or 'quite' less adequate and convenient.[11] On the whole, the respondents are 'quite' less satisfied with such an environmental change. This indicates that high-rise development is essentially a negative stress to the neighboring households.

The ratings given by the house dwellers and walk-up apartment

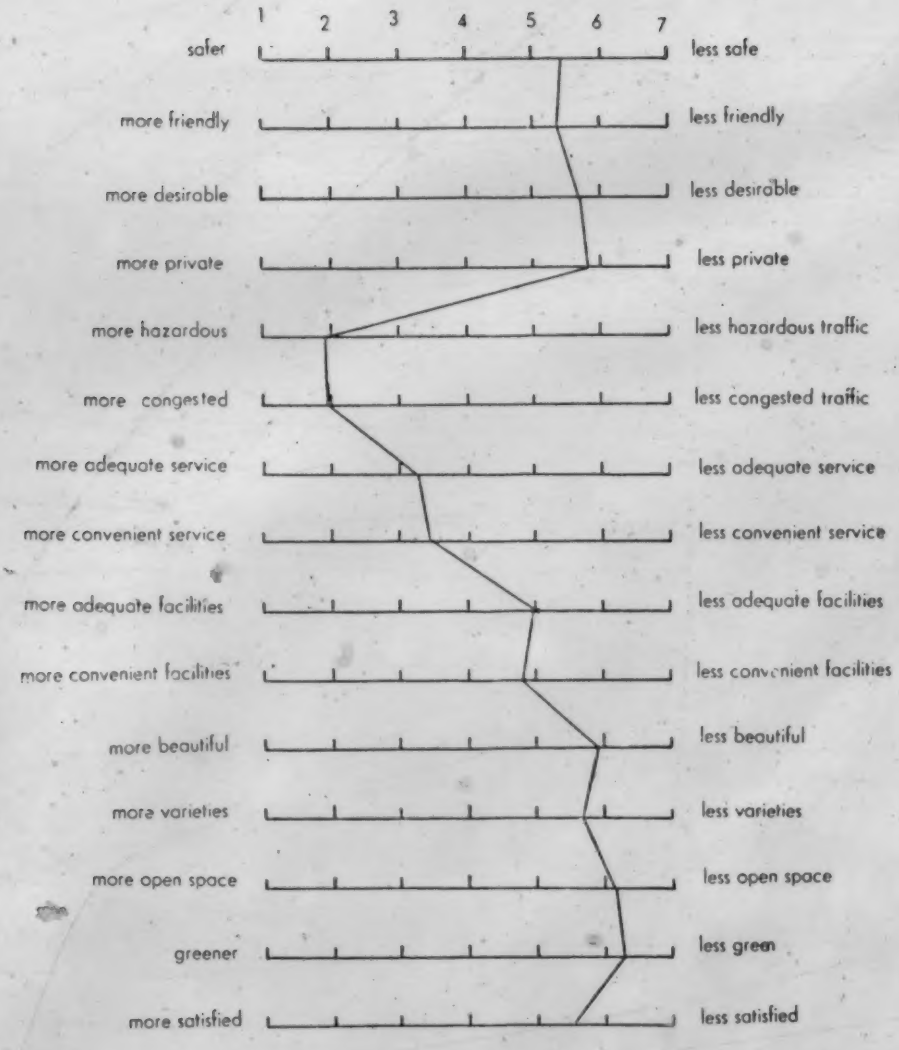


FIGURE 5-1 Mean Scores of the Ratings on the Chosen Semantic Differentials ($n \simeq 85$)

residents show slight differences. Table 5-1 and Figure 5-2 reveal that the walk-up apartment residents give lower ratings on those variables concerning the social environment of the neighborhood, including 'safe', 'friendly', 'desirable', and 'private' and on variables describing the service accessibility. With regard to traffic condition, the walk-up apartment residents do not think that high-rise developments would bring about the same degree of hazard and congestion as the house dwellers do. However, the former give a slightly but consistently higher rating on variables concerning the physical environment of the neighborhood, including 'beautiful', 'varieties', 'open space' and 'green', that is, they are more dissatisfied with the changes in the neighborhood's physical environment than the house dwellers. Nonetheless, on the whole, the walk-up apartment residents are less dissatisfied with high-rise developments.

Mann-Whitney's test on rankings are used to find out whether the differences in the ratings between the two types of respondents are statistically significant. The reasons for using this test have been discussed previously. Table 5-2 gives the results of the tests. It can be seen that only 4 of the ratings are significantly different, even at $p=0.1$ level. The house dwellers' ratings on 'safe', 'adequate service' and 'convenient service' are significantly higher than those of the walk-up residents. On the other hand, the former's ratings on 'hazardous traffic' are significantly lower. In general, greater differences are found in variables concerning the neighborhood's

Table 5-1

Mean Rating Scores on the Semantic Differentials of All Three Study Areas*

Variables	All Respondents	House Dwellers	Walkup Dwellers
Safe	5.45(66)	5.66(53)	4.77(13)
Friendly	5.32(65)	5.57(51)	4.71(14)
Desirable	5.62(69)	5.77(52)	5.18(17)
Private	5.78(67)	5.89(53)	5.36(14)
Hazarding Traffic	1.97(71)	1.80(54)	2.53(17)
Congested Traffic	1.96(67)	1.71(53)	2.50(14)
Adequate Service	3.25(68)	3.34(53)	2.93(15)
Convenient Service	3.32(66)	3.49(52)	2.71(14)
Adequate Facilities	5.01(68)	5.30(57)	5.27(11)
Convenient Facilities	4.78(59)	4.73(49)	5.00(10)
Beautiful	5.97(67)	5.96(53)	6.07(14)
Varieties	5.62(66)	5.50(54)	6.17(12)
Open Space	6.16(64)	6.12(52)	6.33(12)
Green	6.22(65)	6.17(53)	6.42(12)
Satisfied	5.48(63)	5.58(52)	5.18(11)

*The figures within the parentheses give the size of the sample

Source: Survey Data

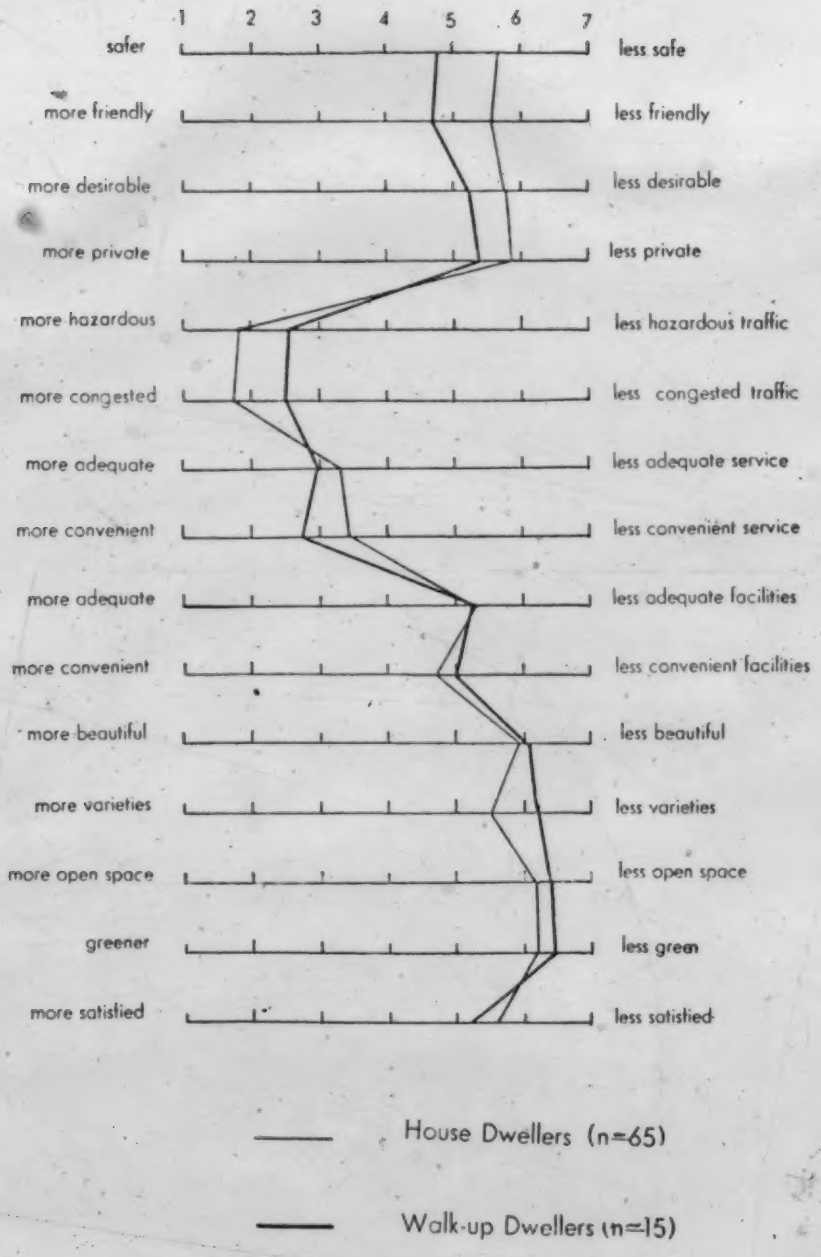


Figure 5-2 Mean Rating Scores By the Walk-up and House Dwellers in all Study Areas

Table 5-2

Results of the Mann-Whitney Tests on the Rating Differences: between House and Walkup Dwellers

Variable	z
Safe	2.54**
Friendly	1.54
Desirable	1.45
Private	0.34
Hazardous Traffic	1.64*
Congested Traffic	0.36
Adequate Service	2.26**
Convenient Service	2.19**
Adequate Facilities	0.32
Convenient Facilities	0.14
Beautiful	0.25
Variety	0.35
Open Space	0.09
Green	0.46
Satisfied	1.36

*Significant at 0.10
**Significant at 0.05

Source: Survey Data

social environment. For the other ratings, the differences are generally small, in accordance with the picture revealed by Figure 5-2.

The variation of the ratings with respect to the relative location of the study areas is even smaller. In order to control the effect due to the differences between house and walk-up dwellers, only the ratings given by the former will be examined. The mean score of ratings given by the house dwellers in the three study areas are given in Table 5-3 and plotted in Figure 5-3. It is obvious that not only the variations of the ratings among the three groups are small, in addition, no particular trend of variation can be depicted. This observation is confirmed by the results of Mann-Whitney tests, which are given in Table 5-4. Only one of the 45 z values computed by means of Mann-Whitney's formula is significant at $p=0.1$ level. Furthermore, no pattern of variation is apparent. Thus, if the three study areas represent different distance zones from the city center, then the findings suggest that distance from the city center is not an important variable in shaping the individual's cognitive structure, with respect to his attitude towards high-rise developments; since the ratings by the subjects show very little variations across study areas.

C. Factor Analysis on the Semantic Differentials

Since the size of the sample is rather small, the ratings given by the respondents living in the three study areas are aggregated to form a single set of readings. The consistency of their rating

Table 5-3

Mean Rating Scores Given by the House Dwellers in the Three Study Areas*

Variable	Central	University	Peripheral
Safe	5.29(14)	5.73(22)	5.77(17)
Friendly	5.85(13)	5.55(22)	5.59(17)
Desirable	5.39(13)	5.91(22)	5.77(17)
Private	5.62(13)	5.86(22)	6.11(18)
Hazardous Traffic	1.86(14)	1.68(22)	1.89(18)
Congested Traffic	1.69(13)	1.77(22)	1.94(18)
Adequate Service	2.93(14)	3.41(22)	3.78(18)
Convenient Service	3.17(12)	3.36(22)	3.83(18)
Adequate Facilities	5.80(8)	4.77(22)	5.41(17)
Convenient Facilities	5.10(10)	4.50(22)	4.83(17)
Beautiful	5.69(13)	5.91(22)	6.22(18)
Varieties	5.39(13)	5.38(21)	5.47(17)
Open Space	6.31(13)	5.91(22)	6.23(17)
Green	6.08(13)	6.23(22)	6.17(18)
Satisfied	5.57(14)	5.60(20)	5.56(18)

*The figures within the brackets are the sizes of subsamples

Source: Survey Data

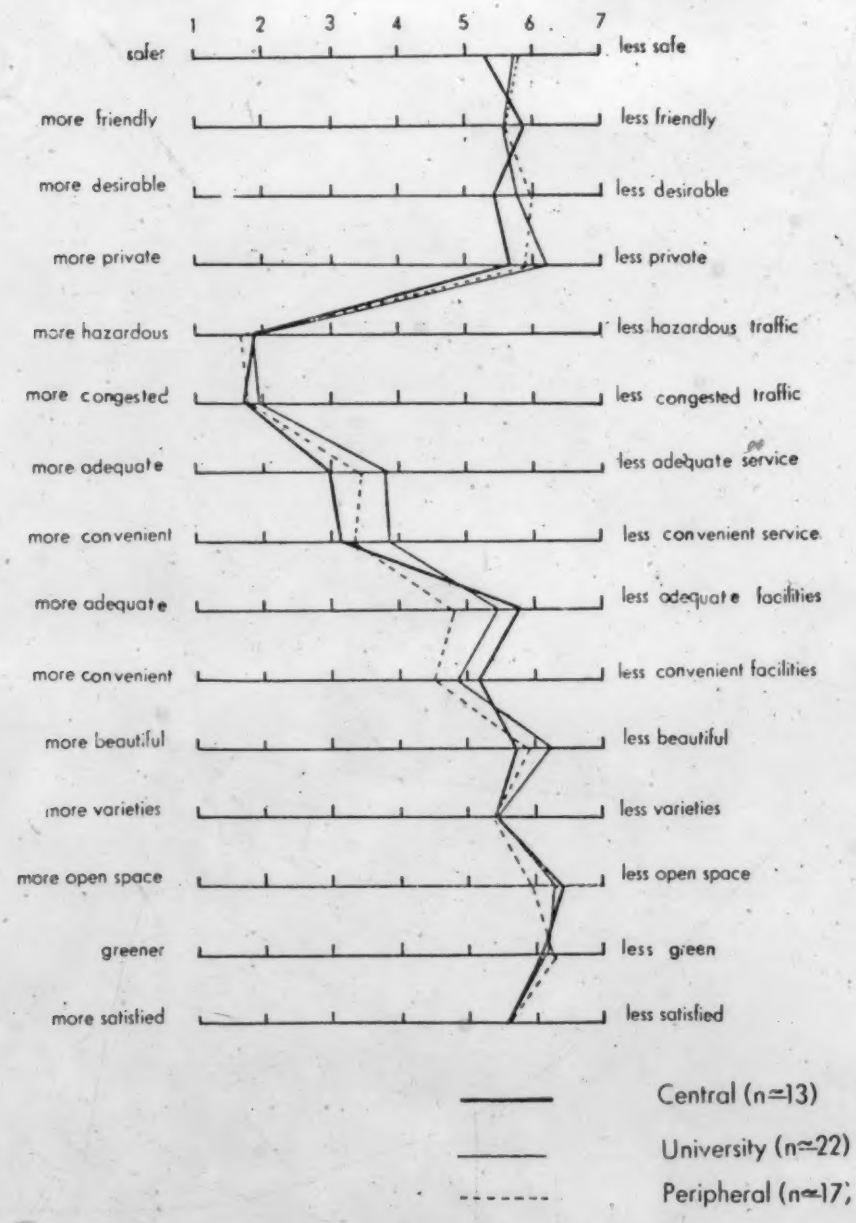


FIGURE 5-3 Mean Rating Scores Given by House Dwellers in the Study Area

Table 5-4

Results of Mann-Whitney Tests on the Ratings between House Dwellers in Each Pair of Study Areas (in z)

Variable	C-U	U-P	C-P
Safe	0.67	0.11	0.54
Friendly	0.14	0.09	-0.24
Desirable	0.14	-0.20	0.26
Private	0.79	1.27	0.65
Hazardous Traffic	-0.23	0.48	0.08
Congested Traffic	0.19	0.53	0.02
Adequate Service	0.34	1.86*	1.52
Convenient Service	-0.70	1.17	0.83
Adequate Facilities	0.84	1.22	-0.30
Convenient Facilities	0.47	0.04	0.03
Beautiful	0.21	0.31	0.38
Varieties	-0.23	0.28	-0.32
Open Space	-0.44	-0.35	0.56
Green	0.14	-0.46	-0.13
Satisfied	0.12	-0.31	0.15

*Significant at 0.10

Source: Survey Data

patterns justify the aggregation procedure, in the sense that the sample will still be an unbiased representation of the population. The original set of data has to be modified prior to the application of factor analysis to account for missing information. First, if a respondent fails to give ratings on more than half of the semantic differentials, his case will be deleted. Altogether, there are ninetine such cases deleted. Second, for the other missing observations, the mean scores of the variables in which the missing observations occur are used as substitutes. For instance, when an observation is missing in the central study are subsample on the variable 'friendly', then the mean of friendly in that subample is substituted for the missing datum. Using these methods, a total of 68 observations on each variable are obtained. This gives a 14 scales X 68 observations matrix to be factor analyzed. It has to be pointed out, however, that the two scales on traffic condition have been inverted prior to the analysis. That is, an original rating of 1 will be treated as 7 and vice versa; and similar transformation is carried out for other rating scores. This procedure is necessary because these two variables, in their original form, are believed to be correlated negatively with other variables used in the factor analysis.

The principal axes factor solution is chosen. This implies the factors extracted are orthogonal to each other. The initial communalities of the variables (or the correlation matrix of the variables) are estimated by the square multiple correlations of the original correlation matrix (see Table A-1).[12] The estimates

stabilize after four iterations of factor extraction. Since ten iterations have been carried out, the estimated communalities should be close to the true values. The original factors extracted are subject to a varimax rotation. Eigenvalues equal to 1 are selected to be the criterion in determining the number of significant factors.[13] That is, only those factors with eigenvalues greater than or equal to 1 are to be considered. The rotated factors with their associated loadings on each of the variables are given in Table 5-5.

The four factors extracted account for 62.5 per cent of the total variance of the original 14 X 14 correlation matrix. When compared to previous studies on semantic differentials, the result can be considered to be rather satisfactory.[14] It may indicate, however, that the semantic subspace related to the concept of neighborhood environmental change due to high-rise developments is not fully represented by the extracted factors.

The loadings on each factor show distinct clusters. The first factor is heavily loaded with variables related to the social environment of the neighborhood, although there are three variables describing the neighborhood's physical landscape having factor loadings greater than 0.4. This factor is labelled 'social environment' accordingly. The second and third factors have their greatest loadings on variables describing the facilities and services accessibilty of the neighborhood and are thus named 'facility accessibilty' and service accessibility' factors respectively. The last factor has its heaviest loadings on variables related

Table 5-5

Loadings on the Rotated Factors Extracted by the Principal Factor Solution*

Original Variables	Factor I Social Environment	Factor II Accessibility to Service	Factor II Accessibility to Facilities	Factor IV Physical Environment
Safe	0.676	0.183	-0.075	0.182
Friendly	0.516	0.067	-0.002	0.123
Desirable	0.736	0.133	0.089	0.288
Private	0.741	0.000	0.090	0.106
Hazardous Traffic	0.128	0.010	0.111	0.846
Congested Traffic	0.077	0.015	0.100	0.786
Adequate Service	0.041	0.097	0.888	-0.049
Convenient Service	0.082	0.096	0.870	-0.032
Adequate Facilities	0.011	0.883	0.132	0.104
Convenient Facilities	0.028	0.877	0.065	0.099
Beautiful	0.403	0.064	0.102	0.672
Varieties	0.214	0.165	-0.041	0.613
Open Space	0.424	0.166	-0.096	0.482
Green	0.442	0.326	0.180	0.545
Esgen values	4.288	2.046	1.378	1.025
Cummulative % of Total Variance	36.63	45.25	55.09	62.41

*Factor loadings greater than 0.4 are underlined

Source: Survey Data

to traffic condition and the physical landscape of the neighborhood. Therefore, it is denoted as the 'physical environment' factor.

The pattern revealed by the factor analysis is thus very similar to the results of the content analysis presented in Chapter Two. Differences do exist, however. Two distinct factors related to the accessibility characteristics of the neighborhood appear. Each of these factors accounts for almost ten per cent of the total variance. This suggests that they play an important role in shaping the cognitive structure of the individual with respect to his attitude. That is, the findings indicate that the individual believes that high-rise developments are strongly associated with a change in the accessibility characteristics of the neighborhood, whereas, the content analysis suggests that accessibility is not an important variable in explaining the individual's feeling towards high-rise developments.

The discrepancy may be a result of measurement errors. More likely, it is due to some other reason. In particular, the two analyses may not measure the same phenomenon. Probably, the factors extracted are those that describe, in general, the semantic subspace related to the concept of neighborhood change due to high-rise developments. On the other hand, answers to the open-ended questions are related directly to the satisfaction level of the respondents. These answers do not cover the whole of the semantic subspace concerned. In order to determine the relative importance of each

extracted factor in determining the individual's satisfaction level toward high-rise developments, the factor scores computed are regressed against the surrogate measure, the subjects' ratings on the variable 'satisfied-unsatisfied.' The result of the analysis will indicate how the individual's cognitive structure regarding his attitude towards high-rise developments as described by the four factors determines his state of satisfaction.

Gorsuch has pointed out that the primary influence on the correlation coefficients, which form the basis of factor and regression analyses, appears to be the rank order of the observations rather than the intervals between points on the scale.[15] It is for this reason that factor analysis can be applied to ordinal data. Similarly, regression analysis of the semantic differential ratings will be legimate if tests of statistical significance are not performed. It is because the latter tests rely on the metric properties and normal distribution of the data. If Osgood's contention that semantic differentials are essentially metric in nature is accepted,[16] then, statistical tests on the regression coefficients become meaningful.

The coefficients of the zero-order correlation between the variable 'satisfied-unsatisfied' and the extracted factors are given in Table 5-6. As can be expected, the rating on the satisfaction level is positively correlated with each of the factors. In other words, if the high-rise developments can bring about a 'better' social or physical environment, or increased accessibility in

the neighborhood, the respondents will be more satisfied. The correlation coefficients vary, however. Two of the factors, 'social environment' and 'physical environment' stand out to give the highest correlations with the variable 'satisfied', while the r's given by the two accessibility factors are very low.

The same picture is represented by the results of the step-wise regression, as summarized in Table 5-7. Since the principal factor solution gives orthogonal factors, the problems associated with auto-correlation among independent variables are virtually non-existent. In addition, all the independent variables are expressed in the same scale, that of the standardized factor scores. Therefore, the b coefficients indicate the relative importance of the factors in determining the individual's state of satisfaction. It is clearly shown in Table 5-7 that 'social environment' is the most important factor, followed by that of 'physical environment'. The two accessibility factors are rather unimportant in explaining the individual's state of satisfaction. If metric scale is assumed, then the analysis shows that the former factors are highly significant, with z-scores on the b coefficients equal to 8.69 and 6.16 respectively for the 'social environment' and 'physical environment' factors. In other words, they are significant at even 0.001 level. On the other hand, the b's of the two accessibility factors are statistically insignificant at $p = 0.1$. This implies that the changes in the accessibility characteristics of the neighborhood due to high-rise developments are

Table 5-6

Correlation Coefficient of "Satisfied" with Each of the Factors

	Factor I (Soc. Env.)	Factor II (Acc. Fac.)	Factor III (Acc. Ser.)	Factor IV (Ph. Env.)
r	0.674	0.114	0.054	0.513

Table 5-7

Result of the Step-Wise Regression of "Satisfied" with the Extracted Factors

Variable	b	s.e.(b)	Step in Enter The Regression	Step-Wised Partial r
Constant	5.549			
Social Environment	1.077	0.124	1	0.674
Accessibility to Facilities	0.168	0.118	3	0.178
Accessibility to Services	0.087	0.119	4	0.092
Physical Environment	0.746	0.121	2	0.608
Multiple R			0.818	
Total Variance Explained			66.9%	

*Significant at p = 0.01

Source: Survey Data

unimportant in determining the respondents' satisfaction level.

The results of the factor and regression analyses are thus apparent. With regard to the concept 'changes in the neighborhood environment due to high rise developments', the individual's cognitive state can be essentially described by four variables, namely, 'social environment', 'service accessibilty','facility accessibilty' and 'physical environment'. Each of these is positively correlated with the individual's satisfaction level. Nevertheless, only changes in 'social environment' and 'physical environment' are important in governing the individual's state of satisfaction whereas the changes in the accessibilty characteristics are rather unimportant. The result is remarkably similar to those found by the content analysis presented earlier.

II. The Householder's Time Allocation Pattern and High-rise Development in His Neighborhood

A. Re-statement of the Hypotheses

After analyzing the factors that are responsible for the stress brought about by high-rise developments, the influence of the stress on the individual's activity system will be examined.

It was argued that the stress concerned would affect only the individual's leisure or discretionary activities (see Chapter 2). A 14 activity category system of classification has been adopted to facilitate the analysis of the effect of the stress. They are

re-listed here for reference.

A1 - socializing with neighbors at home

A2 - socializing with friends at home

A3 - sports and relaxation in the yard

A4 - family gathering in the yard

A5 - reading and relaxation inside the dwelling

A6 - family gathering in the dwelling

A7 - house upkeeping

A8 - yard upkeeping

A9 - visit neighbors

A10- visit friends

A11- shopping in small neighborhood groceries

A12- other shopping

A13- family outing

A14- participation in neighborhood associations

Since the respondents were asked to indicate their time spent on each of the above activities on both 'an average weekday' and on 'an average Sunday', there are altogether 2 X 14 - 28 activity categories to be considered. In the second chapter, it was hypothesized that under the stress associated with high-rise developments in the individual's neighborhood, his activity system will undergo the following changes:

(1) The individual will, ceteris paribus, reduce the time he allocates to activities A1, A2, A3, A4, A7, A8 and A9 on both weekday and Sunday.

(2) The time spent on other activities will be different from that before the high-rise constructions although the direction of change cannot be specified. From this, it can be inferred that the individual's entire discretionary activity pattern will be different from before.

It was shown in the last chapter that walk-up apartment dwellers have demographic characteristics similar to those of high-rise residents. Also, the difference in the dwelling characteristics between walk-up and high-rise apartments are much smaller than that between houses and high-rises. It is reasonable, therefore, to expect the effect of high-rise apartment developments on the walk-up dwellers will be smaller than that on the house residents. In order to discern the adjustment process exhibited by the household with respect to its daily activity routines, it is more fruitful to examine the house dwellers alone. Hence, the above hypotheses apply to the house dwellers only.

It was pointed out in Chapter Three that a longitudinal approach to the problem is not feasible. The time related hypotheses thus have to be investigated by means of cross-sectional analysis. Instead of observing the changes in the time allocation patterns manifested by a sample of householders over time, comparison of the patterns manifested by the 'study' and 'control' groups of households will be made. Since the questionnaires are addressed to the head of households, the actual hypotheses to be tested are:

H1. The 'average' head of household living in areas with

high-rise developments is spending less time in activities A1, A2, A3, A4, A7, A8 and A9 than the 'average' head living in comparable areas without high-rise apartments.

H2. The general patterns of time allocation on the selected discretionary activities of the 'average' head of households in the 'study' and 'control' areas are different.

If the survey findings support the above hypotheses, the validity of the time related hypotheses (1) and (2) can be inferred. The inference is risky, however. Problems related to were discussed in some detail in Chapter three.

B. The Pattern of Time Allocation on the Selected Activities as Reported by the Respondents

In order to obtain a general idea of how people spend their time daily, the present section will begin by examining the time allocation pattern on the selected activities manifested by the respondents, including those living in the study and control areas. The findings on the general time use pattern can be a basis for further comparisons when the sample is subject to stratification Since the sizes of the subsamples vary, the averages of the means and standard errors of the time spent on each of the selected activities by the subsamples are calculated; ie., equal weights are given to each of the sampling areas.[17] The means of the time spent on the selected activities are ranked and plotted in Figure 5-4a

and 5-4b, with the X-axis representing the rank order of the activities in terms of the mean time spent by the respondents. It can be seen that the rank order patterns of the means for weekday and Sunday are similar. Activities A6, family gathering in the dwelling; A5, reading and relaxation in the dwelling; and A2, socializing with friends at home, account for much fo the respondents' leisure time on both weekday and Sunday. On the other hand, A14, participation in neighborhood associations; A9, visiting neighbors; and A11, shopping in small neighborhood grocery stores are least frequently engaged in on both days (Table 5-8).

The pattern exhibited between the two days is not identical, however. Spearman's r_s, calculated for the two rank order patterns is 0.662. Although it is significantly different from 0, the correlation coefficient is not very high, indicating that differences exist between the two patterns. The data collected show, in general, people spend more time in visiting (A7) on Sunday than on weekdays. On the other hand, the average time devoted to household work (A10) and shopping (A12) on weekdays is more than on Sunday.

It has to be noted that the pattern revealed is quite different from what had been reported in previous studies; in particular, those of Chapin's. A comparison of the mean time spent by the heads of households on comparable activities between this research and Chapin's study at Washington, D.C., 1968[18] is given in Table 5-9.

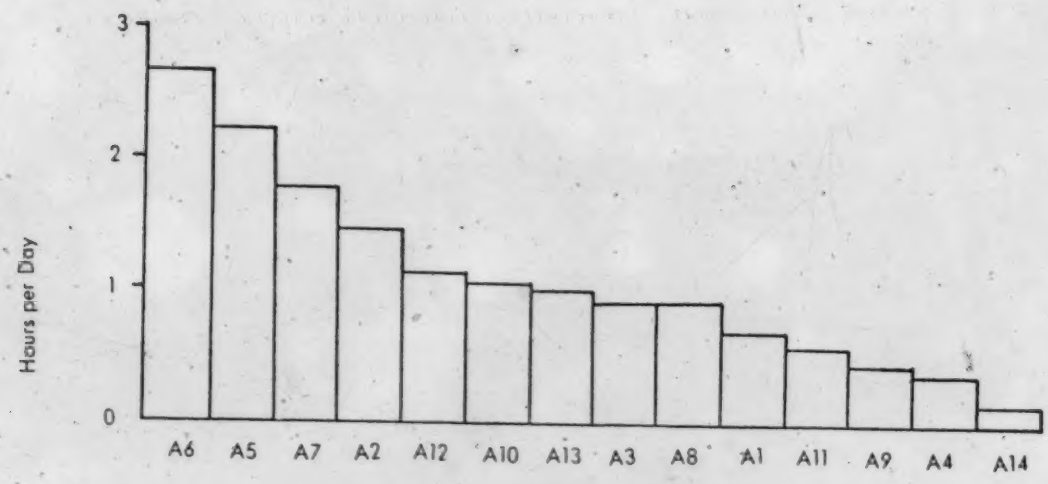


FIGURE 5-4 Mean Time Spent by the Respondents on the Selected Activities a. Weekday (n≃150)

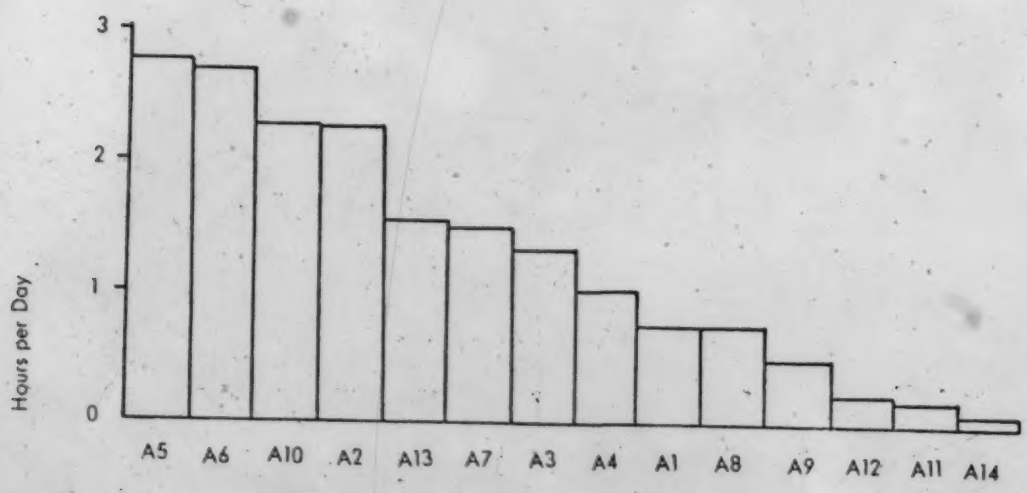


FIGURE 5-4 Mean Time Spent by the Respondents on the Selected Activities b. Sunday (n≃150)

Table 5-8

Mean Time Spent on the Selected Activities by Both the "Study" and "Control" Groups of Respondents (in hours)*

Activity	Weekday				Sunday			
	$\bar{x}$	s.e.($\bar{x}$)	Rank	N	$\bar{x}$	s.e.($\bar{x}$)	Rank	N
A1	0.72	0.137	10	157	0.76	0.154	9	154
A2	1.48	0.195	4	151	2.29	0.275	4	152
A3	0.91	0.123	8.5	156	1.35	0.175	7	155
A4	0.40	0.082	13	155	1.04	0.137	8	152
A5	2.23	0.197	2	148	2.77	0.371	1	147
A6	2.69	0.190	1	148	2.73	0.245	2	145
A7	1.76	0.143	3	149	1.50	0.177	6	148
A8	0.91	0.113	8.5	143	0.75	0.094	10	140
A9	0.47	0.065	12	156	0.49	0.083	11	151
A10	1.09	0.121	6	174	2.30	0.213	3	144
A11	0.59	0.054	11	152	0.19	0.041	13	152
A12	1.15	0.139	5	146	0.23	0.077	12	146
A13	1.01	0.181	7	151	1.57	0.186	5	147
A14	0.15	0.046	14	156	0.08	0.034	14	155

*The means and standard errors are weighed averages of the scores given by each subsample. See footnote 25 for an explanation of the weighing procedure.

Spearman's rank correlation between ranks given by weekday and Sunday is 0.662 with z = 2.387. That is, significant at 0.05.

Source: Survey Data

Table 5-9

A Comparison of the Mean Time Spent by the Head of Housholds on Some Selected Activities between Findings by This Survey and Those by Chapin's Study of Washington, 1968 (in hours)*

Activities	Weekday		Sunday	
	This Study	Chapin's Study	This Study	Chapin's Study
Visiting[a]	1.56(6)	0.83(4)	2.79(4)	0.95(4)
Shopping[b]	1.74(5)	0.36(6)	0.42(6)	0.07(7)
Family outing[c]	0.72(7)	0.07(7)	1.57(7)	0.14(6)
Socializing at home[d]	2.20(4)	0.52(5)	3.05(5)	0.75(5)
Relaxation[e]	3.60(1)	1.27(3)	4.02(3)	1.86(3)
Family Gathering[f]	2.23(3)	3.26(1)	3.77(1)	3.44(1)
Home and yard upkeep[g]	2.62(2)	2.47(2)	2.25(2)	2.19(2)

*The figures listed in the parentheses represent the ranks of the activities according to the time spent.

Results of Spearman's Rank Correlation Analysis

(1) For Weekday $r_s = 0.75$, $z = 1.837$ (2) For Sunday $r_s = 0.679$, $z = 1.66$

Both values var significant at $p = 0.1$

a. For the present study, includes A9 and A10 of the present classification. For Chapin's study includes 17, 19, 20 and 14 of his 40-codes system.
b. A11 and A12 for present study; 06 for Chapin's.
c. A13 for present study; 16 and 26 for Chapin's
d. A1 and A2 in the present study; 18 and 13 in Chapin's
e. A3 and A5 in the present system; 22, 23, 24, 25 and 29 in Chapin's
f. A4 in this system; 05, 27 and 28 of Chapin's
g. A7 and A8 in this system; 08 and 09 in Chapin's

Source: This study: Survey Data; Chapin's Study. F. S. Chapin Jr. Human Activity Pattern in the City. N.Y.: John Wiley and Son Inc., 1974. Tables A3, p. 253 and A5, p. 255

Activity categories in the original classification system are regrouped to give comparable categories for both studies. Mean time computed for the original categories is summed, yielding the figures listed in the table. The use of summation is somehow doubtful, especially when applied to the present study. It is because activities in the original set are not mutually exclusive. The summation tends to give over-estimates. Whereas in the case of Chapin's study, time allocated to concurrent activities was first evenly split before the data were presented and thus the summation of the mean time is more feasible. Moreover, the original classification systems employed are quite different from each other. Although regrouping would minimize the difference, activity categories in the new system may not carry the same meaning for both studies. Therefore, identical results would not be expected. The differences in the mean times reported between the two studies still appear to be too great to be accounted for by these factors.

If the rank order of the mean time spent on each of the activities is considered alone, however, much of the difference between the two findings disappears. The rank correlation, r_s of the two patterns calculated for weekday and Sunday respectively are 0.750 and 0.679. Although both coefficients are not perfect (that is , 1.0) and are statistically significant only at $p=0.1$, the imperfection can be expected when factors causing the difference in the results discussed above are considered. In addition, only data collected from the present survey are used in the hypothesis testing. the

question of whether the mean times reported are overestimates is rather unimportant, providing such an overestimation is common to all respondents in both the 'study' and 'control' groups. Hence, statistical tests based on the survey data will still be meaningful.

In table 5-10, the means of the time allocated to each of the selected activities by the study and control groups are given, along with the associated standard scores (z) of difference of the means between the two subsamples. The table reveals, in general, that the study group spends less time on those activities with signs of differences specified by hypothesis H1 than the control group on both weekdays and Sunday. These activities are A1, A2, A3, A4, and A7, A8 and A9. Out of the fourteen categories of activity (seven for weekdays and seven for Sunday) under investigation, only one, namely, A9 of weekdays, is not in agreement with the predicted direction. Although few of the differences for individual activities are significant even at p= 0.1 level, the remarkable consistency in their signs with the predicted direction suggest that the alternate hypothesis is at work. That is, for those activities which are negatively affected by high-rise developments, in the sense that the utility level derived from them is reduced under the environmental stress concerned, the time allocated to them will be reduced.

To test the validity of the above statement, a pair-t test on the standard scores of differences is carried out. As pointed out in the third chapter, the test is a useful technique for studies involving an experimental and a control group of subjects, whether

Table 5-10

Mean Time Allocated to the Chosen Activities by the "Study" and "Control" Groups of House Dwellers Along with the Standard Scores of Differences of Mean (Time is Expressed in Hours)[a]

Activity	Weekday			Sunday		
	Study	Control	z	Study	Control	z
A1	0.55	1.02	-1.56*	0.56	1.05	-1.15
A2	1.16	1.92	-1.42*	1.75	2.49	-1.10
A3	0.81	1.43	-1.73*	1.64	1.71	-0.14
A4	0.35	0.58	-1.15	0.99	1.73	-1.91*
A5	2.55	1.97	1.26	2.75	2.53	0.41
A6	2.82	2.42	0.91	2.62	2.52	0.20
A7	1.73	1.96	-0.59	1.11	1.15	-0.14
A8	1.01	1.55	-1.80*	0.97	1.20	-0.87
A9	0.65	0.49	1.18	0.48	0.54	-0.29
A10	1.14	1.01	0.45	2.19	1.93	0.58
A11	0.57	0.55	0.16	0.16	0.16	-0.02
A12	0.91	1.17	-1.02	0.32	0.10	1.37
A13	0.80	1.12	-1.02	0.73	2.00	-2.62*
A14	0.21	0.12	0.83	0.04	0.09	-0.71

[a]The z score underlined are values with predicted negative sign. The sample size of each of the 14 activities is about 55 for the "study" group and 50 for the "control" group.

*z score significant at 0.1 (with one-tail tests for scores with predicted signs, and two-tail tests for scores without predicted direction).

Source: Survey Data.

they be truly experimental studies or ex post facto researches.

Since the present classification of activities is only one of an unknown number of possible alternatives, it can be assumed that the categories listed represent a sample of an indefinite number of activity categories. The mean time allocated to each of the selected activities by the study and control groups of respondents can be treated as a pair of matching observations. The observations of the time allocated to the selected activities by the two groups can be thought of as being a sample of an indefinite number of matching pairs of observations. The differences between each of the pairs as expressed in terms of z are standardized and thus comparable to each other. The hypothesis to be tested can be stated more formally:

> The mean of the standard scores of differences on those variables with predicted signs, that is, A1, A2, A3, A4, A7, A8 and A9 on both weekdays and Sunday is negative and is significantly different from zero. From this, it can be inferred that the individual's time allocated to the above activities will be reduced as a consequence of high-rise developments. Hypothesis H1 is therefore valid.

The mean of the z's is calculated to be -.0.906, with a standard deviation of 0.816. A t test on the difference between the mean and 0 give a t-value of -4.004 which is highly significant at 13 degrees of freedom (p less than 0.005 for an one-tail test). This implies

that the householders in the study areas, on average, indeed spend less time on those activities assumed to be negatively affected by high-rise developments. Hence, hypothesis H1 is supported by the evidence provided by the survey.

When the sample is further stratified according to the relative location of the study areas, the above conclusion still holds. Tables 5-11, 5-12 and 5-13 give the mean time spent on the selected activities by the respondents of the central, university and peripheral sets of study areas respectively. A summary of the pair-t tests carried out for each of the study area sets is presented in Table 5-14. The findings show, in general, that the difference between the 'study' and 'control' groups of respondents is insignificant if any specific activity is considered alone, due to the variation within each variable and the much reduced sample size. For those variables with predicted direction of differences, however, the signs of the t's, substitutes of the standard scores, z's, for small samples, generally agree with the specified directions. The results of the pair-t tests indicate that the mean of t in every set of areas is negative, with the university and peripheral areas significantly different from 0 at $p = 0.5$ and 13 degrees of freedom, by means of an one-tail test. This indicates that although the residents in the central study area have similar attitudes toward high-rise developments as people living in the university and peripheral study areas, they do not show the same degree of adjustment to the stress brought about by such developments

Table 5-11

Mean Time Allocated to the Selected Activities in the Central Areas for House Dwellers[a]

Activities	Weekday			Sunday		
	Study	Control	t	Study	Control	t
A1	0.406(16)	0.313(8)	0.293	0.286(14)	0.625(8)	-0.675
A2	1.194(14)	2.429(7)	-0.956	1.880(15)	2.167(7)	-0.220
A3	0.306(16)	0.813(8)	-1.028	1.033(15)	0.75 (8)	0.506
A4	0.469(16)	0.944(9)	-0.706	0.333(15)	1.063(8)	-1.141
A5	2.50 (15)	1.625(8)	0.946	2.679(14)	2.0 (7)	-0.992
A6	1.887(16)	3.375(8)	1.226	2.113(15)	3.75 (8)	0.662
A7	2.287(15)	2.50 (8)	-0.177	1.429(14)	1.688(8)	-0.40
A8	0.669(13)	1.00 (7)	-0.645	0.208(12)	0.571(7)	-0.744
A9	0.467(15)	0.175(8)	1.228	0.077(13)	0.313(8)	-0.907
A10	1.053(15)	0.875(8)	0.297	2.536(14)	1.438(8)	0.916
A11	0.454(13)	0.756(9)	-0.979	0.069(13)	0.322(9)	-1.089
A12	1.285(13)	1.214(7)	0.116	0.867(12)	0.125(8)	1.112
A13	0.413(15)	0.544(9)	0.375	0.962(13)	0.125(8)	0.132
A14	0.347(15)	0.0 (9)	1.614	0.014(14)	0.0 (9)	1.0

Source: Survey Data

[a] t-values are used as substitutes for z due to smallness of the sample. Those t's underlined have signs predicted.

*t significant at 0.10. One-tail tests for values with predicted directions and two-tail tests otherwise.

Table 5-12

Mean Time Allocated to the Selected Activities of the University Areas for House Dwellers[a]

Activities	Weekday			Sunday		
	Study	Control	t	Study	Control	t
A1	0.78(25)	1.17(27)	-0.549	0.94(25)	0.94(27)	0.0
A2	1.20(26)	2.46(26)	-1.389*	1.92(26)	2.11(26)	-0.189
A3	0.92(25)	1.78(28)	-1.422*	1.62(25)	1.80(28)	-0.291
A4	0.35(25)	0.44(26)	-0.508	0.78(25)	1.58(26)	-1.707*
A5	3.44(24)	2.91(27)	2.04*	3.07(24)	2.69(27)	0.819
A6	2.91(24)	1.45(26)	0.676	2.72(24)	2.10(26)	0.505
A7	1.49(24)	1.30(27)	0.556	1.00(24)	0.82(27)	0.462
A8	1.23(24)	1.40(27)	-0.318	0.81(24)	1.43(27)	-1.796*
A9	0.70(26)	0.38(27)	1.269	0.50(26)	0.22(26)	1.677*
A10	0.90(23)	1.09(25)	0.483	2.67(23)	1.39(25)	-1.428
A11	0.66(26)	0.39(27)	1.613	0.30(26)	0.09(27)	2.234*
A12	0.61(26)	1.14(25)	-1.717*	0.09(26)	0.04(25)	-0.59
A13	0.97(26)	1.01(25)	-0.123	1.02(25)	1.38(25)	0.709
A14	0.20(26)	0.14(27)	0.879	0.07(26)	0.02(27)	1.008

Source: Survey Data

[a] t-values are used as substitutes for z due to smallness of the sample. Those t's underlined have signs predicted.

*t significant at 0.10. One-tail tests for values with predicted directions and two-tail tests otherwise.

Table 5-13

Mean Time Allocated to the Selected Activities in the Peripheral Areas for House Dwellers[a]

Activites	Weekday			Sunday		
	Study	Control	t	Study	Control	t
A1	0.375(20)	1.19(16)	-1.564*	0.29(20	1.44(16)	-2.008*
A2	1.074(19)	0.753(15)	0.637	1.43(20)	1.79(15)	-0.495
A3	1.079(19)	1.159(17)	-0.137	2.16(19)	2.00(17)	0.144
A4	0.263(19)	0.553(17)	-0.829	1.79(19)	2.31(16)	-0.520
A5	2.229(19)	1.987(16)	0.828	1.99(17)	2.47(16)	0.725
A6	2.667(18)	2.119(16)	0.428	3.30(18)	2.63(16)	-0.527
A7	1.588(17)	2.794(16)	-1.430*	1.00(18)	1.42(16)	0.803
A8	0.967(18)	2.056(16)	-2.106*	1.67(18)	1.10(15)	0.917
A9	0.768(19)	0.712(17)	0.152	0.75(18)	0.20(16)	-0.765
A10	1.593(15)	0.950(16)	1.097	1.51(18)	0.19(16)	-1.527
A11	0.522(18)	0.687(16)	0.635	0.03(18)	3.73(15)	-1.288
A12	1.056(18)	1.194(16)	-0.295	0.31(18)	0.28(16)	0.457
A13	0.867(18)	1.633(15)	-0.881	0.78(18)	3.73(15)	-3.267*
A14	0.0 (19)	0.181(16)	-1.436	0.0 (19)	0.28(16)	-1.100

Source: Survey Data

[a] t-values are used as substitutes for z due to smallness of the sample. Those t's underlined have signs predicted.

*t significant at 0.10. One-tail tests for values with predicted directions and two-tail tests otherwise.

Table 5-14

A Summary of the Pair-t Tests on Variables with Predicted Direction of Difference

	Central	University	Peripheral
Mean of t's	-0.301	-0.398	-0.514
s.d. of t's	1.020	0.563	0.964
pair-t	1.064	2.549	1.923
significance level	not significant	0.025	0.05
d.f.	13	13	13

Source: Survey Data

as residents of the other two study areas; since the mean of the t's computed for the former group is statistically insignificant. In addition, the results suggest that H1 is a valid hypothesis, although tests on individual activities do not give overwhemingly significant results. It can be concluded, therefore, that the individual will adjust to a negative environmental stress by reducing the amount of time spent on those activities being negatively affected, as predicted by the theoretical model presented in the first chapter.

A somewhat different approach is undertaken to test the second hypothesis, which states that the general patterns of time allocated to the selected activities by the 'study' and 'control' groups of respondents are different. Instead of making full use of the information obtained by the survey, only the rank order of the mean time allocated to each of the activities is considered. This avoids the problems associated with frequent occurrence of missing observations and crudity of the data base; although at the same time it implies a reduction of the metric scale measures to ordinal scale ones.

The means of the time spent on the selected activities given in Table 5-10 are plotted in Figure 5-5a and 5-5b. For the purpose of comparison, the X-axis represents the rank order of the activities when the control and study subsamples are aggregated for the calcuation of the means. It can be observed that the general rank order patterns exhibited by both the study and control groups of

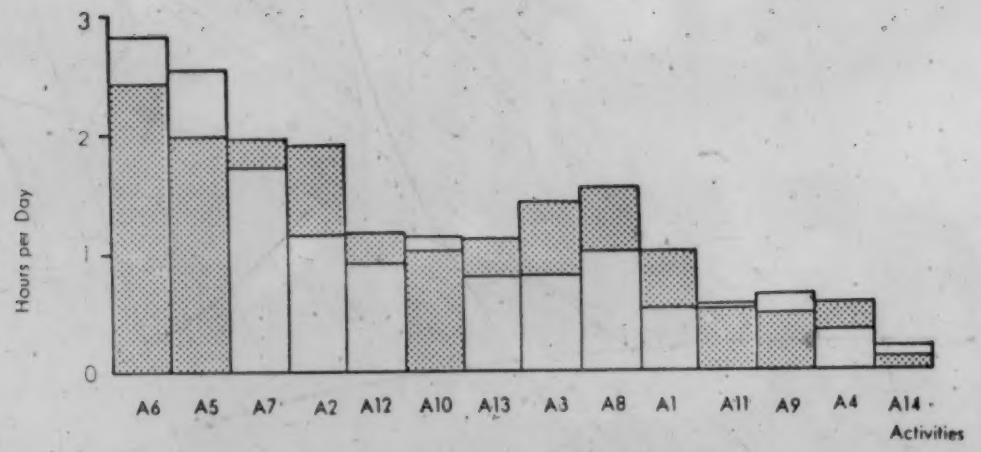


FIGURE 5-5 Mean Time Allocated to the Selected Activities:

House Dwellers in the Study and Control Groups a. Weekday

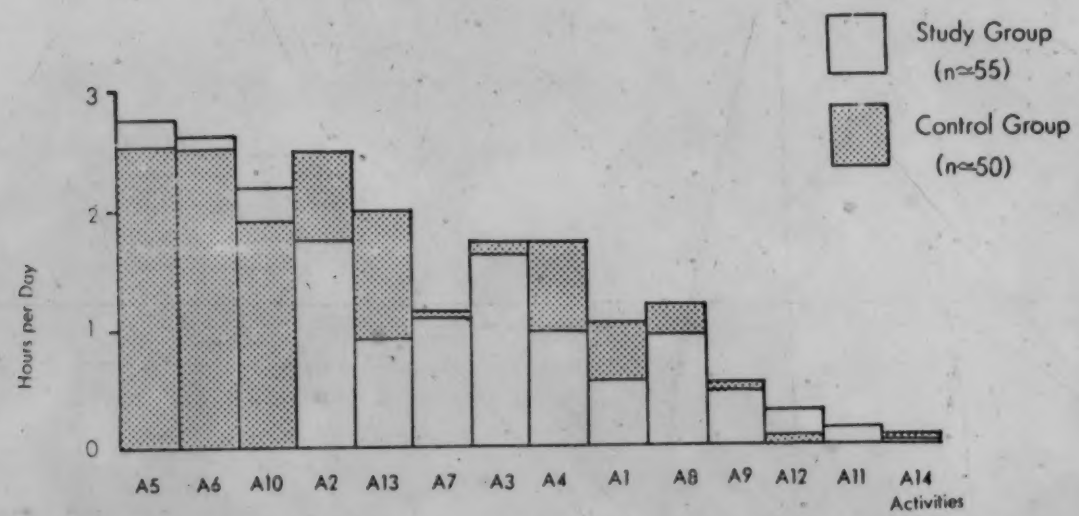


FIGURE 5-5 Mean Time Allocated to the Selected Activities:

House Dwellers in the Study and Control Groups b. Sunday

respondents resemble that of the aggregated sample. The similarity is further illustrated by Table 5-15 in which the rank orders of the activites of the two groups are given. Spearman's rank order correlation coefficients calculated for the two patterns for weekdays and Sunday are 0.892 and 0.912, respectively, which are significant at p=0.01. The very high correlations calculated between the two groups suggest that the null hypothesis has to be accepted. In other words, there is no essential difference, as shown by the survey data, in the time allocation patterns between the study and control groups of respondents with respect to the chosen activities. Hypothesis H2 is thus rejected.

A closer examination of the z scores given in Table 5-10 reveals the same picture. There are only six variables having significant z values. Among them, five are those variables with signs of differences specified by hypothesis H1. This implies that the patterns of time allocation between the two groups are, on the whole, similar to each other.

The rejection of hypothesis H2 leads to the rejection of the original time related hypothesis. It seems that the stress brought about by high-rise developments in the individual's neighborhood is not sufficient to have significant effects on his entire activity pattern. On the other hand, the results of the pair-t tests presented earlier indicate that the time allocated to those activities which are negatively affected by high-rise developments is reduced. It can be concluded that the effect of high-rise developments is restricted to this set of activities only.

Table 5-15

A Comparison of Time Allocation Patterns in Terms of Rank Orders of the Means, between the "Study" and "Control" Groups of House Dwellers

Activity	Weekday		Sunday	
	Study	Control	Study	Control
A1	12	9	10	10
A2	4	4	4	3
A3	8	6	5	7
A4	13	11	6	6
A5	2	2	1	1
A6	1	1	2	2
A7	3	3	7	9
A8	6	5	8	8
A9	10	13	11	11
A10	5	10	3	5
A11	11	12	13	12
A12	7	7	12	13
A13	9	8	9	4
A14	14	14	14	14
Spearman's r	0.892		0.912	

In order to find out whether there is any locational variation regarding the effects of high-rise developments in the individual's time allocation pattern, the sample is further stratified. Spearman's rank order correlations between the study and control groups are calculated for all three sets of study areas and are summarized in Table 5-16. All of the correlation coefficients are quite high, with the lowest being 0.65 and the highest 0.87. In addition, they are not significantly different from 1, the perfect correlation, at $p = 0.1$. This implies that there is no significant difference between the activity patterns of the study and control groups of respondents. In other words, the survey data do not give supporting evidence for hypothesis H2.

The correlation coefficients show some locational variations. The coefficients calculated for the peripheral area on both weekdays and Sunday are the lowest. On the other hand, the university and control areas have correlation coefficients that are similar to each other. This suggests that the impact of high-rise developments on the individual's activity pattern would be greater in a more peripheral location than in an inner city neighborhood.

Although the findings do not give support to hypothesis H2, it may not be concluded that the individual's neighborhood environment is unimportant to his activity system. The study and control areas are chosen to be similar so that the effect of high-rise apartment developments can be isolated. Similar patterns of activity found between the two groups of respondents can only signify that the

changes in the neighborhood envrinoment associated with such developments would not be so prominent as to have any significant impact on the householder's activity system.

This point can be further illustrated. Instead of calculating the rank order correlations between the study and control groups for each set of the study areas, correlation coefficients between every pair of study areas can be calculated for study and control groups separately. The results of which are given in Table 5-17.

Each set of study areas, whether central, university or peripheral, represents a distinct type of neighborhood residential environment. Whereas, the control and study areas differ primarily in that the latter contains high-rise apartments while the former does not. It is therefore reasonable to expect the variations in the environmental characteristics, including social and physical, will be greater among sets of study areas than between the study and control areas within the same set. If neighborhood environment is a determining factor of the individual's activity system, then lower correlations are likely to be found between patterns of two sets of study areas than those between the study and control groups of the same set.

A comparison of Tables 5-17 and 5-16a, and b suggests that the above postulation is likely to be valid. Out of twelve 'between areas' correlations given in Table 5-17, three are significantly different from 1.0 at p= 0.1; whereas, none of the coefficients in Tables 5-16 .a and b is significant. Moreover, six of the former

Table 5-16a

Rank Orders of the Mean Time Spent on the Selected Activities on Weekdays

Activity	Central		University		Peripheral	
	Study	Control	Study	Control	Study	Control
A1	3	3	6	8	3	7
A2	10	12	10	13	9	5
A3	1	6	8	12	10	8
A4	7	8	2	4	2	2
A5	14	11	14	14	13	11
A6	12	14	13	11	14	13
A7	13	14	12	9	11	14
A8	8	9	11	10	7	12
A9	5.5	2	5	2	5	4
A10	9	7	7	6	12	6
A11	5.5	5	4	3	4	3
A12	11	10	3	7	8	9
A13	4	4	9	5	6	10
A14	2	1	1	1	1	1
Spearman's r	0.873		0.811		0.714	

Source: Survey Data

Table 5-16b

Rank Orders of the Mean Time Spent on the Selected Activities on Sunday

Activity	Central		University		Peripheral	
	Study	Control	Study	Control	Study	Control
A1	5	8	7	6	3	7
A2	11	13	11	13	9	8
A3	9	7	10	11	13	9
A4	6	9	15	9	11	10
A5	14	12	14	14	12	12
A6	12	14	13	12	14	13
A7	10	11	8	5	7	6
A8	4	6	6	8	10	4
A9	3	4	4	4	5	5
A10	13	10	12	10	8	11
A11	2	5	13	3	2	2
A12	7	3	2	2	4	1
A13	8	2	9	7	6	14
A14	1	1	1	1	1	3
Spearman's r	0.749		0.868		0.653	

Source: Survey Data

Table 5-17

A Summary of the Rank Order Correlation Analysis on the Sets of Study Areas

	Central University	University Peripheral	Central Peripheral
Weekdays			
Study	0.612*	0.779	0.687
Control	0.719	0.653	0.680
Sunday			
Study	0.914	0.633*	0.745
Control	0.749	0.824	0.488*

*Significantly different from 1.0 at $p \leq 0.1$; using a one-tail test.

Source: Survey Data

coefficients are less than 0.7 where only one is found in the latter tables. Although there are too few 'sampling points' to allow a difference of means test on the two sets of coefficients, the difference in the picture revealed by Tables 5-16a,b and 5-17 is quite obvious. This implies that the individual's activity system is related to his residential environment. In addition, it suggests that studies on the spatial variation of the activity systems may yield more fruitful results.

C. A Further Examination on the Relation Between High-rise Developments and the Household's Activity Pattern

The results of the pair-t tests support the hypothesis that less time is spent on those activities assumed to be negatively affected by high-rise developments for the individuals or the heads of households living in the study areas than in the control areas. A relationship between the environmental stress concerned and the household's activity pattern is inferred. This relationship will be examined more closely here.

It can be hypothesized that the strain or uneasiness imposed on the individual is related to his perception of high-rise developments and the distance of his place of residence from the high-rise apartments in his neighborhood. It can be expected that the more he is dissatisfied with such developments, and the closer his place of residence is from the high-rise apartments concerned, the stronger will be the strain imposed on the individual.[19] This, would, in turn, lead to a greater adjustment of his activity system.

The findings presented thus far suggest that the relation applies probably to those activities with predicted direction of difference for the mean time between the study and control groups of house dwellers only. Therefore, only those activities will be considered.

To measure the degree of adjustment in terms of cross-sectional data for individual respondents is very difficult, if not impossible. In the analysis which follows, the mean time spent on each of the activities under consideration by the control group of respondents in each of the areas is assumed to be the time spent by all the respondents in the study group before the high-rises were constructed in their neighborhood. Deviations from it exhibited by the 'study' respondents, that is, the differences between the assumed 'origin' and the actual time as reported by the respondents in the study group, are treated as a proxy measure of the actual change experienced by the subjects. The validity of such a measure is highly questionable. At best, it can be a very crude estimate of the adjustment process. More reliable measure are unavailable, however, because of the limitation of cross-sectional analyses. It may not be surprising to find very disappointing results of analyses based on such measures.

The hypothesized relationship can be stated more formally. Let

$$\Delta t_{ij} = \frac{t_{ijk} - \overline{T_{jk}}}{\text{s.e.}\ (\overline{t_{jk}})}$$

where t_{ijk} is the time devoted by individual i living in

study area k on activity j;

$\overline{T_{jk}}$ is the mean time spent by the repondents living in control area k on activity j;

s.e.$(\overline{t_{jk}})$ is the standard error of the mean time spent by all respo dents living in study area k on activity j, this variable is introduced to standardize the derived measure Δt_{ij} across all study areas.

Δt_{ij} is expected to be negative, since the respondents in the study group spend less time, on the average, on the activities under investigation

The foregoing discussion suggests

$$\Delta t_j = f(s)$$

where

s is the strain on the individual; and

$$f'(s) < 0;$$

that is, the stronger the strain, the greater will be the respondent's time spent on activity j and the mean time spent by the control respondents on that activity.

It is hypothesized that

$$s = s(satisf, dist)$$

where 'satisf' is the individual's rating on his satisfaction level with regard to high-rise developments and 'dist' is the distance of his place of residence and the nearest high-rise apartment.

And,

$$s'(satisf) > 0$$

since the more dissatisfied he is, the higher will be the rating, and the greater will be the strain on him.

In addition,

$$s'(\text{dist}) < 0$$

since the further away from the stress inducing agent, the lesser will be the strain.

Hence,

$$f(\bar{s}) = f(s(\text{satisf}, \text{dist}))$$

$$df = \frac{df}{ds} \cdot \frac{\partial s}{\partial \text{satisf}} \cdot d\text{satisf} + \frac{df}{ds} \cdot \frac{\partial s}{\partial \text{dist}} \cdot d\,\text{dist}$$

Consider the independent variable 'satisf' alone:

$$\frac{df}{d\,\text{satisf}} = \frac{df}{ds} \cdot \frac{\partial s}{\partial \text{satisf}} < 0$$

Similarly, for the variable 'dist'

$$\frac{df}{d\,\text{dist}} = \frac{df}{ds} \cdot \frac{\partial s}{\partial \text{satisf}} > 0$$

That is, the derived measure Δt_j is inversely related to the variable 'satisf' and directly related to 'dist'

Both Spearman's rank order correlation and Pearson's product moment correlation are used to test the relationship. The results of which are given in Table 5-18. It can be seen that few of the coefficients calculated are significant. In fact, it seems there is no correlation at all between Δt_j's and the chosen variables 'satis' and 'dist'. The standardized coefficients of the regression equations, β's, are also calculated and listed in the table. Again, few of the coefficients are statistically significant even if metric scale can be assumed for the variable 'satisf', Moreover, the signs of the correlation coefficients for the variable 'dist' tend to be consistently in the opposite direction to what are predicted. The survey data thus fail to give supporting evidence

Table 5-18

Results of Correlation Analyses on Δtj's and "Satisf" and "Dist"

for All "Study" Acess House Dwellers

Δtj	satisf			dist		
	r_s	r	βsatisf	r_s	r	βdist
For Weekdays						
j=A1	-0.014	-0.014	-0.087	-0.313*	-0.217	-0.243*
A2	-0.066	-0.102	-0.074	0.303*	0.115	0.093
A3	0.167	0.054	0.040	0.088	-0.058	-0.046
A4	-0.094	-0.224	-0.272*	0.109	-0.074	-0.158
A7	0.306*	0.249*	0.227*	-0.228*	-0.143	-0.075
A8	0.076	-0.279*	-0.331*	-0.083	-0.074	-0.173
A9	0.119	0.137	0.086	-0.157	-0.196	-0.170
For Sundays						
j=A1	-0.012	0.076	-0.004	-0.389*	-0.264*	-0.265*
A]	0.115	0.218	0.146	-0.275*	-0.285*	-0.241*
A2	0.141	0.082	0.045	-0.129	-0.137	-0.123
A3	-0.014	0.023	-0.027	-0.010	-0.158	-0.166*
A7	-0.031	-0.028	-0.031	-0.131	0.001	-0.009
A8	-0.091	-0.049	0.006	0.158	0.182	0.184
A9	0.051	0.065	0.015	0.057	-0.173	-0.169

*Coefficient significant at p=0.05

Source: Survey Data

to the relationship hypothesized.

III. Other Aspects of High-rise Developments and the Neighboring Household's Activity System

Although a more detailed description of the relationship between high-rise developments and the neighboring householder's activity is not possible because of the limitation of cross-sectional studies, nevertheless, the existence of a relationship is demonstrated by the prior analysis. Additional evidence is provided by the field survey. The data show that 28 per cent (18 out of 65) of the house dwellers indicate that their in-home activities are affected by the neighboring high-rise developments, although it is rather difficult for people to recall their past activity pattern. On the other hand, only 9 per cent (6 out of 69) say that their out-of-home activities are affected.

It was pointed out in the second chapter that the individual may seek adjustments in his activity pattern besides altering the time he spends on some specific activities. When the environmental stress is an essentially negative one (as defined in the first chapter), the individual may seek isolation from the stress inducing agent in order to maintain his previous activity pattern. Table 5-19 a and b give the frequency distribution of the return questionnaires by the answers to the question "Have you tried to maintain your previous activity pattern?" It can be seen that more than two-thirds of the respondents (living in houses) indicate that they have tried in one way or another.

Table 5-19

Frequency Distribution of the House Dwellers Who Have Tried to Maintain Their Previous Activity Patterns

	Central	University	Peripheral	Total
Yes	11	21	11	43(71.7%)
No	6	4	7	17(28.3%)

Source: Survey Data

Of the 43 who indicate that they have tried to maintain their previous activity pattern, 17 say that they have tried to accomplish it by putting up fences, 9 by doing the same activities but at a different time and place, and 17 by other means.

Furthermore, out of 21 households in the study group which have children, 12 indicate that their children's activities are affected by high-rise developments. More specifically, 11 of them think that the increase in traffic hazards have an effect on their children; 8 are afraid of too many strangers present in the neighborhood; and 6 think that high-rises affect their children's activities in some other manner. The size of the sample of the households with children is too small to warrant more detailed analyses, though.

It was argued that the individual may seek release of the strain by means of residential relocation. Table 5-20 gives the frequency distribution of the respondents who intend to move in the foreseeable future. There is a higher percentage of the house dwellers in the study group intending to move than those in the control group, although the difference is not significant statistically at 0.05 level by a difference of proportion test. Within the study group, 11 or 44 percent of those who intend to move indicate that high-rise developments in their neighborhood are related to their relocation consideration.

These findings indicate that the individual's and household's

Table 5-20

Distribution of the Respondents Who Intend to Move in the Forseeable Future

	Study	Control
Move	25(36.2%)	15(27.2%)
Stay	44(63.8%)	40(72.8%)

Source: Survey Data

activity system is related to his residential environment. Changes in the environment may lead to changes in his activity pattern. The dissatisfaction induced by the environmental changes may also result in a change of the individual's residence, which would, in turn, alter his activity pattern to a large extent. The failure to give a detailed description of the relationship involved suggest further research along this line of inquiry is necessary in order to have a better understanding of the individual's activity system under environmental stress.

Footnotes

1. Charles E. Osgood, George J. Suci and Percy H. Tennebaum. The Measurement of Meaning. Urbana: University of Illinois Press, 1957. pp. 18-30; and 318-31. Reprinted in James G. Snider and Charles E. Osgood. Semantic Differential Technique. Chicago: Aldine Publishing Co. pp. 56-82.

2. Ibid. Reprinted in Osgood and Snider, ibid., p. 64.

3. Charles E. Osgood, and George Suci, "Factor Analysis of Meaning." Journal of Experimental Psychology. Vol. 50, 1965. pp. 325-58.

4. Charles E. Osgood, "Semantic Differential Technique in Comparative Study of Cultures." American Anthropologists. Vol. 66, 1964. pp. 171-200.

5. Stephant Golant and Ian Burton, "A Semantic Differential Experiment in the Interpretation and Grouping of Environmental Hazards." Geographical Analysis. Vol. 2, 1970. pp. 120-35.

6. R. M. Downs, "The Cognitive Structure of an Urban Shopping Center." Environment and Behavior. Vol. 42, 1970. pp. 13-39.

7. R. J. Johnston, "Spatial Patterns in Suburb Evaluation." Environment and Planning. Vol. 5, 1973. pp. 385-95.

8. Robert J. Diaiso, D.M. Friedman, L.C. Mitchell and E.R. Schweitzer. Perception of Human Environment. A Comparison of Racial and Density Preference. Graduate School of Public and International Affairs and Graduate School of Public Health, University of Pittsburgh, Pittsburgh, 1970.

9. Charles E. Osgood, "Semantic Differential Technique in the Comparative Study of Cultures." Amerfcan Anthropologists. Vol. 66, 1964. pp. 171-200.

10. Osgood, ibid. Here, a scale between 1 and 2 or 6 and 7 is considered to be 'extremely'; between 2 and 3 or 5 and 6 to be 'quite'; and between 3 and 4 and 4 and 5 to be 'slightly'. This is a slight modification of Osgood's system in which a scale of -3 to +3 is used.

11. The term 'services' refers to items such as government and medical services while the term 'facilities' refers to parks and other facilities found in the neighborhood.

12. Gorsuch points out that the square-multiple correlation obtained from a set of data based on a sample of the population will give close estimates of the population communalities. See R. L. Gorsuch. Factor Analysis. Philadelphia: W. B. Saunders, Co., 1974.

13. It is the most widely used criterion and is thus employed here.

14. A collection of studies employing the method is given in Snider and Osgood, op. cit. The percentage of variance extracted by interpretable factors reported in these studies ranges from 35 to 70%.

15. Gorsuch, op. cit., p. 128.

16. Osgood, op. cit., and Cliff, Norman, "Adverbs as Multipliers." Psychological Review. Vol. 16, 1959. pp. 27-44.

17. The weighting procedure is as follows:
Let i = 1, 2, 3 stands for the central, university and peripheral areas, and j = 1, 2 stands for the study and control groups respectively. Then,

$$\overline{x}_{grand} = \left(\sum_i \sum_j \overline{x}_{ij}\right) / 6$$

and,

$$s.e.(\overline{x}_{grand}) = \sqrt{\sum_i \sum_j s.e.(\overline{x}_{ij})^2} \; / \; 6$$

The calculation of the standard error of the grand mean is a modification of the formula for the standard error of the sum of means. See, e.g., Murray R. Spiegal. Statistics. Schaum's Outline Series. New York: McGraw Hill Books Co., 1961. p. 143. For a comparison of the unweighted scores, see Table A-2.

18. In Chapin's study, the time allocation pattern includes that of the spouses. See F.S. Chapin. Human Activity Patterns in the City. Things People Do in Time and Space. New York: John Wiley and Sons, Incorp., 1974. p. 253, Table A-3 and p. 255, Table A-5.

19. For a discussion of the concepts of stress strain, see Chapter 1, Section II.

CHAPTER SIX

SUMMARY AND CONCLUSION

To explain intra-urban migration, the urban theorists have put special emphasis on the motives of the potential migrants. Relocation is considered as a measure to minimize the influence of environmental disturbances or stress by a number of authors, notably Wolpert,[1] Brown and Moore[2] and Golant.[3] These authors recognize, however, that migration is a very costly and time consuming process and would not be employed unless the uneasiness caused by the stress is severe. They argue that, under most circumstances, the individual will seek adustments in situ instead, either by changing his pattern of behavior, or by restructuring the environment in his own favor, so that his needs can be better satisfied. Although empirical studies on intra-urban migration are numerous, few studies articulate themselves to the process of in situ adjustments. In order to have a better understanding of the process involved, the present study addressed itself to this problem. More specifically, this study attempted to investigate the adjustments in the individual's and household's activity routines under environmental stress.

By reference to the theoretical and empirical studies on the human activity system, and the micro-economic theory of consumer behavior, a theoretical model on adjustments of the activity system to environmental stress was derived. The model states, under an

essentially negative stress, the individual will, ceteris paribus, allocates less time to the activities that are negatively affected by the stress.

High-rise developments in the individual's neighborhood were chosen to be the stress under investigation. It is suggested by past studies and demonstrated by the survey data that householders, on average, are not satisfied with such developments in their neighborhood. Hence, high-rise developments are essentially a negative environmental stress to the neighboring householders. Based on the theoretical model derived, two hypotheses concerning the individual's adjustments to the environmental stress with respect to his daily activity routines were formulated. The first hypothesis states that the individual will allocate less time to those activities assumed to be negatively affected under high-rise developments in his neighborhood. The second postulates that under such a stress, the entire discretionary activity pattern of the individual will be altered.

A cross sectional approach was adopted to investigate the hypothesized relationship. Activity patterns of people living in high-rise neighborhoods are compared to those living in areas without high-rise apartments. Limitations of the approach to process studies were recognized. Nevertheless, it was noted that this method possesses certain advantages which cannot be matched by other research designs.

The empirical findings indicate that the individual's cognitive state with regard to high-rise developments can be essentially described by four factors: (1) social environment; (2) physical environment; (3) service accessibility; and (4) facility accessibility of the neighborhood. The analysis shows that the individual's dissatisfaction with such developments is largely attributed to his attitude towards the associated changes in the social and physical environment of the neighborhood. Accessibility characteristics of the neighborhood are rather unimportant to explain his state of satisfaction. Therefore, the stress brought about by high-rise developments can be expressed in terms of the first two factors.

The findings also indicate that the respondents living in the study areas spend less time on those activities assumed to be negatively affected by high-rise construction as compared to those in the control areas. That is, the first hypothesis is verified. The stress of high-rise developments appears not to be sufficient enough to bring about a significant change in the individual's entire activity pattern, however. The second hypothesis is thus rejected.

An attempt was made to examine the relationship between the individual's activity system and the environmental stress concerned. The attempt was a failure because of the limitations of cross-sectional analysis. The rather unsatisfactory result does not

expressway or a subway system in an urban area are examples of this type of developments. It has to be noted that the study period may extend over a very long period, since it may take decades for a proposed subway or highway system to be completed. Such a study can only be undertaken if time is not a constraint. For this reason, future studies employing the cross-sectional approach are still important. Hopefully, further insights can be provided by such efforts in understanding the relationship between environmental stress and the individual's or household's activity system. Simulation techniques may be an attrative alternative to empirical longitudinal studies. The paremeters and network of relationship involved in the simulation process may be specified by the findings of cross-sectional analyses.

Finally, the impact of the stress brought about by high-rise developments shows locational variation. It was revealed that the difference between the study and control group of respondents in the central area regarding their time allocated to the negatively affected activities is not significant statistically. In addition, among the respondents living in the three sets of study areas, the greatest difference in the time allocation pattern between the study and control group is manifested by the peripheral respondents. The result of the analysis indicates that high-rise apartment developments would have greater impact on the neighboring householder's activity pattern if the developments take place in the peripheral districts of the city.

signify that the theoretical model is without empirical relevance, although the validity of the assumptions of utility maximization and all other things being equal condition, are questionable. The survey provides additional evidence to support the existence of a relationship between high-rise residential developments and the household's activity system.

A few conclusions can be drawn from the findings. First, they suggest that stresses such as high-rise developments in the individual's neighborhood is unlikely to induce a marked change in his entire activity pattern. It is probably because many of his discretionary activities are indispensible to his weld being. The survey-data indicate that the individual may try to isolate from the stress inducing agent by such measures as putting up fences in his yard in order to maintain his previous activity pattern. To those activities that are negatively affected by high-rise developments, however, the adjustment is more apparent. These include activities like socializing with neighbors and the various recreational activities in the yard.

The results also suggest that a longitudinal study is necessary in order to have a more complete understanding of the adjustment process. This implies that the choice of environmental stress has to be reconsidered. It is prudent for the researcher to consider developments which involve a large area and would have significant impact on the neighborhood environment so that the spatial variation of the adjustment process can be examined. The construction of an

It may not be concluded that the future high-rise apartments should be constructed in the inner city neighborhoods. The findings indicate locational variation of the impact is rather small. Furthermore, the attitude of the respondents in the three study areas are very similar. They are equally dissatisfied with this type of residential development in their neighborhood. The location of future high-rise apartments should be determined by the preference of the potential residents. However, the neighboring household's loss of utility associated with the developments should be compensated in one way or another.

Footnotes

1. Julian Wolpert, "Migration as an Adjustment to Environmental Stress," Journal of Social Issues. Vol. 22, 1966. p. 93.

2. Lawrence A. Brown and Eric G. Moore, "The Intra-Urban Migration Process: A Perspective." Geografiska Annaler, Series B, Vol. 52B, 1970. pp. 1-13.

3. Stephen Golant, "Adjustment Process in a System: A Behavioral Model of Human Movement." Geographical Analysis, Vol. 3, no. 3, 1971.

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APPENDIX I

THE QUESTIONNAIRES

TO THE HOUSEHOLDERS IN HIGH-RISE NEIGHBORHOODS

May 30, 1975

Dear Sir/ Madam,

I am a graduate student in the geography department of the University of Alberta. To complete my master's degree, I am doing a thesis on the impact of highrise apartment developments on residential neighborhoods. In particular, I would like to find out in what ways the highrise developments in your neighborhood have affected your daily activities. Hopefully, the study will help towards better planning of the city and improvements in your neighborhood. Your cooperation in answering the following set of questions will be most helpful. Any personal information thus collected will be kept confidential.

Thank you very much for your help.

Yours sincerely,

A. S. Li

Si-ming Li
Department of Geography, U. of A.

This questionnaire should be completed by the head of the household. Please answer the following questions in the appropriate space provided.

1. Number of persons in your family living in your present dwelling_____

2. Your marital status: married_____ single_____ other(specify)_____

   Your age_____ Sex_____

3. Years of residence in your present dwelling._____

4. Do you own or rent the present dwelling? own_____ rent_____

5. How many times has your family moved in the last 5 years? _____

6. Do you intend to move to a new dwelling in the foreseeable future? yes_____
   no_____

If the above answer is YES, please complete 7 and 8; if no, go to 9.

7. a. Have you started to search for a new residence? yes_____ no_____

   b. If yes, how long have you been searching?

   0-2 weeks _____ 2-4 weeks _____ 1-2 months _____
   3-6 months_____ half to 1 year_____ more than 1 year_____

8. a. Is your intended move related to changes in the environment of your neighborhood (eg., increased crowdedness or congestion) due to the highrise development?

   yes_____ no_____

   b. If yes, please explain how the highrise development is related to your intended move._____

_____

_____

If the answer to 7 is NO, please complete 9 and 10; otherwise, go to 11.

9. a. If more highrises are going to be constructed in your neighborhood, would you consider a move? yes_____ no_____ don't know_____

b. If the answer is don't know, please explain._____

_____

_____

10. Will you seek such measures as petitions to prevent further highrise developments in your neighborhood? yes_____ no_____ don't know_____

In the next part of the questionnaire, I would like to find out some of the possible changes in your daily activity pattern as a result of the highrise developments in your neighborhood.

11. The following is a list of activities that you may do at home. Would you please indicate the amount of time you spend in each of the activities <u>in an average weekday</u> and in an average Sunday.

ACTIVITY	TIME SPENT PER DAY			
	WEEKDAY		SUNDAY	
	HOURS	MINS	HOURS	MINS
(a) socializing with neighbors at home				
(b) socializing with friends other than neighbors at home				
(c) sports and relaxation in the courtyard or garden or on the street in front of your dwelling				
(d) family gatherings, eg., picnics or suppers, in the yard or garden				
(e) family gatherings, eg., eating and TV watching, inside the dwelling				
(f) reading and relaxation inside the dwelling				
(g) house upkeeping				
(h) garden and yard upkeeping				
other activities				
_____				
_____				

12. a. Has the highrise development in your neighborhood affected the time you spend on some of the above activities? yes_____ no_____

b. If yes, what are the activities that have been affected? _____

_____

_____

13. a. Have you tried to maintain your previous activity pattern? yes_____ no_____

b. If yes, how?

_____(i) by putting up fences around your courtyard or garden to preserve the previous privacy.

_____(ii)by doing the same activities at different times of the day to avoid hazardous traffic or annoying noice level.

_____(iii)by some other means (please specify)_____

_____

_____

14. How much time, including sleeping, do you spend at home each day?

Time spent per average weekday _____hours
Time spent per average Sunday _____hours

15. The following is a list of activities that you may do outside your home. Would you please indicate the amount of time you spend in each of the activities in an average weekday and in an average Sunday.

ACTIVITY	TIME SPENT PER DAY			
	WEEKDAY		SUNDAY	
	HOURS	MINS	HOURS	MINS
(a) visiting in the neighborhood				
(b) visiting friends outside the neighborhood				
(c) shopping in small neighborhood grocery stores				
(d) shopping outside the neighborhood				
(e) family outings, eg., picnics, movies, etc.				
(f) participation in neighborhood associations, eg.,neighborhood sports club, senior citizen associations, etc.				
other activities(please specify).				
_____				
_____				

16. Has the highrise development affected the time you spend on some of the above activities? yes_____ no_____

If yes, what are the activities that have been affected?

_____

_____

_____

17. How much time, in total, do you spend, besides working and the journey to work, outside your home, in an average weekday and in an average day weekend?

Time spent per average weekday _____ hrs _____ mins
Time spent per average day weekend _____ hrs _____ mins

18. Please give the names and addresses of the stores that are (were) most frequently used by your family at present and before the highrise construction(s). Please list them according to the frequency of use.

At present 1._____

2._____

Before the highrise construction

1._____

2._____

If you have children, please answer questions 19, 20 and 21. They are set up to assess the effect of the highrise apartment developments on your children's recreation activities. If you do not have any child, go to 22.

19. Please give the age ans sex of your children who are under 15.

child	1	2	3	4	5
age					
sex					

20. The following is a list of play areas that may be used by your children frequently. Please indicate the amount of time spent by your children in each of the areas in an average weekday.

	Time spent per day (hours)				
Play Areas	child 1	2	3	4	5
(a) playing at home					
(b) playing in the school					
(c) Playing in the community park					
(d) playing on the street					
other play areas(please specify)					
_____					
_____					

21. Do you think the highrise development(s) in your neighborhood has affected your children's recreational activities?

_____ a. no

_____ b. yes, the traffic condition has become too hazardous for children.

_____ c. yes, there are too many strangers present in the neighborhood.

_____ d. yes, some other reasons.(please specify)_____

_____

22. In what other ways has the highrise development(s) in your neighborhood affected you or your family's daily activities?_____

_____

_____

_____

23. Would you please tell me:

(i) your occupation_____

(ii) your spouse's occupation_____

(iii) annual income of your family:

$4999 or less _____	$5000-6999 _____	$7000-9999 _____
$10000-12999 _____	$13000-15999_____	$16000-19999_____
$20000 or more_____		

The final section of the questionnaire will be concerned with your attitude towards highrise residential developments. Please circle the number that best describe your view towards construction of highrise apartments in a residential neighborhood. Eg.,

"How do you describe the landscape quality with a highrise structure?"

more beautiful 1 2 3 4 5 6 7 less beautiful

Here, '1' means you think it is much more beautiful than without the highrise; '4' means it is the same as without the highrise; and '7' means it is much less beautiful than without the highrise.

a. How do you consider the neighborhood quality with the highrise structure?

safer 1 2 3 4 5 6 7 less safe
more friendly 1 2 3 4 5 6 7 less friendly
more desirable 1 2 3 4 5 6 7 less desirable
more private 1 2 3 4 5 6 7 less private

b. How do you feel about the traffic condition?

more hazardous 1 2 3 4 5 6 7 less hazardous
more congested 1 2 3 4 5 6 7 less congested

c. How do you find the medical and government services in the community?

more adequate 1 2 3 4 5 6 7 less adequate
more convenient 1 2 3 4 5 6 7 less convenient

d. How do you find the community amenities such as park facilities?

more adequate 1 2 3 4 5 6 7 less adequate
more accessible 1 2 3 4 5 6 7 less accessible

e. How do you describe the landscape quality with a highrise structure?

more beautiful 1 2 3 4 5 6 7 less beautiful
more varieties 1 2 3 4 5 6 7 less varieties
more open space 1 2 3 4 5 6 7 less open space
greener 1 2 3 4 5 6 7 less green

f. Overall, are you satisfied with a neighborhood having highrise developments?

very satisfied 1 2 3 4 5 6 7 very unsatisfied

END

Thank you very much for your help. Any comment on the questionnaire as well as the research itself would be most welcome.

TO THE HOUSEHOLDERS IN THE CONTROL AREAS

May 30, 1975

Dear Sir/ Madam,

I am a graduate student in the geography department of the University of Alberta. To complete my master's degree, I am doing a thesis on the relationship between the neighborhood residential environment and household daily activity patterns. Hopefully, the study will help towards better planning of the city and improvements in your neighorhood. Your cooperation in answering the following set of questions will help towards the completion of the research. Any personal information thus collected will be kept confidential.

Thank you very much for your help.

Yours sincerely,

S. Li

Si-ming Li,
Department of Geography, U. of A.

This questionnaire should be completed by the head of the household. Please answer the following questions in the appropriate space provided.

1. Your marital status: married_____ single_____ other(specify)_____
   Your age_____ Sex_____

2. Number of persons in your family living in your present dwelling_____

3. Do you own or rent the present dwelling? own_____ rent_____

4. Years of residence in the present dwelling? _____

5. How many times has your family moved in the last 5 years? _____

6. Do you intend to move to a new dwelling in the foreseeable future? yes_____
   no_____

7. The following is a list of activities that you may do at home. Would you please indicate the amount of time you spend in each of the activities in an average weekday and in average Sunday.

7. continue

ACTIVITY	TIME SPENT PER DAY			
	WEEKDAY		SUNDAY	
	HOURS	MINS	HOURS	MINS
(a) socializing with neighbors at home				
(b) socializing with friends other than neighbors at home				
(c) sports and relaxation in the garden or courtyard or on the street in front of your dwelling				
(d) family gatherings, eg., picnics or suppers, in the yard or garden				
(e) family gatherings, eg., eating and watching TV, inside the dwelling				
(f) reading and relaxation inside the dwelling				
(g) house upkeeping				
(h) garden or yard upkeeping				
other activities				
_____				
_____				

8. How much time, including sleeping, do you spend at home each day?

Time spent per average weekday _____hours
Time spent per average Sunday _____hours

9. The following is a list of activities that you may do outside your home. Would you please indicate the amount of time you spend on each of the activities in an average weekday and in an average Sunday.

ACTIVITY	TIME SPENT PER DAY			
	WEEKDAY		SUNDAY	
	HOURS	MINS	HOURS	MINS
(a) visiting in the neighborhood				
(b) visiting friends outside the neighborhood				
(c) shopping in small neighborhood grocery stores				
(d) shopping outside the neighborhood				
(e) family outings, eg., picnics, movies, etc.				
(f) participation in neighborhood associations, eg., neighborhood sports club, senior citizen associations, etc.				
other activities (please specify).				
_____				
_____				

10. How much time, in total, do you spend, besides working and the journey to work, outside your home each day?

Time spent per average weekday _____hours
Time spent per average Sunday _____hours

If you have children, please answer questions 11 and 12. If not, please go to 13.

11. Please give the age and sex of your children who are under 15 years old.

child	1	2	3	4	5
age					
sex					

12. The following is a list of play areas that may be frequently used by your children. Please indicate the amount of time spent by your children in each of the areas in an average weekday.

PLAY AREAS	CHILD	TIME SPENT PER DAY (HOURS) 1	2	3	4	5
a. playing at home						
b. playing in the school						
c. playing in the community park						
d. playing on the street						
e. other play areas. Please specify						
_____						
_____						

13. Would you please tell me:

(i) your occupation_____

(ii) your spouse's occupation_____

(iii)Annual income of your family:

$4999 or less _____ $5000-6999 _____ $7000-9999 _____
$10000-12999 _____ $13000-15999_____ $16000-19999_____
$20000 or more_____

-END -

Thank you very much for your help.

TO THE HIGH-RISE RESIDENTS

May 30, 1975

Dear Sir/ Madam,

I am a graduate student in the geography department of the University of Alberta. To complete my master's degree, I am doing a thesis on the relationship between the neighborhood residential environment and household daily activity patterns. Hopefully, the study will help towards better planning of the city and improvements in your neighorhood. Your cooperation in answering the following set of questions will help towards the completion of the research. Any personal information thus collected will be kept confidential.

Thank you very much for your help.

Yours sincerely,

S. Li

Si-ming Li,
Department of Geography, U. of A.

This questionnaire should be completed by the head of the household. Please answer the following questions in the appropriate space provided.

1. Your marital status: married_____ single_____ other(specify)_____
   Your age_____ Sex_____
2. Number of persons in your family living in your present dwelling_____
3. Do you own or rent the present dwelling? own_____ rent_____
4. Years of residence in the present dwelling? _____
5. How many times has your family moved in the last 5 years? _____
6. Do you intend to move to a new dwelling in the foreseeable future? yes_____
   no_____
7. The following is a list of activities that you may do at home. Would you please indicate the amount of time you spend in each of the activities in an average weekday and in average Sunday.

7. continue

ACTIVITY	TIME SPENT PER DAY			
	WEEKDAY		SUNDAY	
	HOURS	MINS	HOURS	MINS
a. socializing with friends living in the same apartment				
b. socializing with neighbors, other than those living in the same apartment, at home				
c. socializing with friends other than neighbors at home				
d. reading and relaxation inside your own suite				
e. Sports and relaxation in the garden or courtyard or on the street in front of your dwelling				
f. house upkeeping				
other activities(please specify)				
_____				
_____				

8. How much time, including sleeping, do you spend at home each day?

Time spent per average weekday _____hours

Time spent per average Sunday _____hours

9. The following is a list of activities that you may do outside your home. Would you please indicate the amount of time you spend in each of the activities in an average weekday and in an average Sunday.

ACTIVITY	TIME SPENT PER DAY			
	WEEKDAY		SUNDAY	
	HOURS	MINS	HOURS	MINS
A. visiting friends in the same apartment				
b. visiting friends in the same neighborhood but outside your apartment				
c. shopping in small neighborhood grocery stores				
d. shopping outside the neighborhood				
e. visiting friends outside the neighborhood				
f. participation in neighborhood associations, eg., neighborhood sports clubs, senior citizen association				
other activities please specify)				
_____				
_____				

10. How much time, in total, do you spend, besides working and the journey to work, outside your home each day?

Time spent per average weekday _____hours
Time spent per average Sunday _____hours

If you have children, please answer questions 11 and 12. If not, please go to 13.

11. Please give the age and sex of your children who are under 15 years old.

child	1	2	3	4	5
age					
sex					

12. The following is a list of play areas that may be frequently used by your children. Please indicate the amount of time spent by your children in each of the areas in an average weekday.

PLAY AREAS	TIME SPENT PER DAY (HOURS) CHILD 1	2	3	4	5
a. playing at home					
b. playing in the school					
c. playing in the community park					
d. playing on the street					
e. other play areas. Please specify					
_____					
_____					

13. Would you please tell me:

(i) your occupation_____

(ii) your spouse's occupation_____

(iii)Annual income of your family:

$4999 or less _____ $5000-6999 _____ $7000-9999 _____
$10000-12999 _____ $13000-15999_____ $16000-19999_____
$20000 or more_____

-END -

Thank you very much for your help.

APPENDIX II

RESULTS OF THE STATISTICAL ANALYSES

Table A-1

Correlation Matrix of the Semantic Differential Ratings

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	0.597													
2	0.338	0.373												
3	0.490	0.512	0.601											
4	0.684	0.380	0.531	0.625										
5	0.313	0.218	0.316	0.269	0.809									
6	0.284	0.143	0.282	0.191	0.861	0.771								
7	0.009	-0.021	0.113	-0.039	-0.086	-0.097	0.715							
8	-0.078	-0.031	-0.040	-0.101	-0.107	-0.089	0.808	0.720						
9	0.167	0.012	-0.103	0.060	0.116	0.080	0.192	0.227	0.746					
10	0.183	-0.057	-0.045	-0.088	0.087	0.061	0.160	0.112	0.806	0.735				
11	0.268	0.329	0.516	0.287	0.490	0.456	0.021	0.016	0.114	0.101	0.726			
12	0.332	0.100	0.300	0.255	0.591	0.450	-0.053	-0.034	0.212	0.191	0.571	0.545		
13	0.305	0.225	0.450	0.268	0.324	0.282	0.079	-0.036	0.159	0.189	0.715	0.404	0.639	
14	0.409	0.219	0.422	0.343	0.423	0.399	0.143	0.126	0.366	0.318	0.690	0.414	0.704	0.688

Variable: 1. Safe
2. Friendly
3. Desirable
4. Private
5. Hazardous Traffic
6. Congested Traficc
7. Adequate Services
8. Convenient Service
9. Adequate Facilities
10. Convenient Facilities
11. Beautiful
12. Varieties
13. Open Space
14. Green

Source: Survey Data

Table A-2

Unweighted Means and Standard Errors of the Mean Time Spent on the Selected Activities: All Respondents

Activities	Weekday				Sunday			
	$\bar{x}$	s.e($\bar{x}$)	N	Rank	$\bar{x}$	s.e($\bar{x}$)	N	Rank
A1	0.73	0.13	157	10	0.77	0.16	154	10
A2	1.49	0.20	151	4	2.26	0.26	152	4
A3	0.71	0.14	156	9	1.38	0.18	155	6
A4	0.39	0.08	155	13	1.10	0.18	152	8
A5	2.21	0.19	148	2	2.50	0.24	147	2
A6	2.70	0.19	148	1	2.71	0.24	145	1
A7	1.71	0.14	149	3	1.22	0.13	148	7
A8	0.96	0.13	143	8	0.83	0.11	140	9
A9	0.49	0.07	156	12	0.51	0.09	151	11
A10	1.10	0.12	174	6	2.31	0.21	144	3
A11	0.59	0.06	152	11	0.18	0.04	152	12
A12	1.14	0.14	146	5	0.22	0.07	146	13
A13	1.02	0.18	151	7	1.61	0.19	147	5
A14	0.15	0.07	156	14	0.10	0.04	155	14

Source: Survey Data